RAILROAD GAZETTE

FRIDAY, FEBRUARY 15.

CONTENTS.

Contributions.

Fast Time on the Savannah, Florida & Western.

SAVANNAH, Ga., Feb. 7, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

To disabuse the minds of those persons who may still cling to the idea that the South is noted for "one horse railroads" and slow schedules, I beg to give you, briefly the run made by our vestibule train No. 501, of Feb. 5, which, taking into consideration the length of the run and the weight of the train, is somewhat remarkable.

The train left Savannah at 11:58 a. m., 57 minutes late, her schedule leaving time being 11:01 a. m., and arrived in Jacksonville at 3:45 p. m., on time. The distance is 172 miles, and the entire run was made by Engineer Ambrose with engine No. 80, recently from the Rhode Island shops. This engine has 18 in. × 24 in. cylinders, 6 ft. drivers, and weighs complete 181,820 lbs. The train consisted of four Pullman vestibule cars and one baggage car, and the actual running time was 3 hours 19 minutes, or an average of 51.9 miles per hour. The run was made in 3 hours and 47 minutes, with a number of delays and stops, among which were a stop of 10 minutes at ten-mile post, 8 minutes at Jesup, 7 minutes at Waycross and 3 minutes at Callahan. The actual running speed frequently went up to 60 miles per hour, and in one instance reached 75 miles per hour.

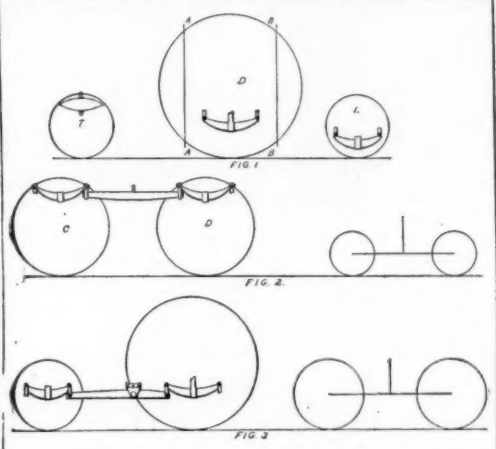
The above run was made with so much ease that when the train reached Jacksonville Engineer Ambrose stepped lightly from his engine, and remarked that he felt as well rested as when he left Savannah, notwithstanding there were at least portions of his run where the "wind blew through his whiskers."

W. W. SYLVESTER.

The Influence of the Position of the Centre of Gravity of a Locomotive in its Track Keeping.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The diagram, fig. 1, is representative of a common type of English locomotive in which there is danger on a bad road of derailment taking place. In many such engines the driving wheel is so far towards the centre of the boiler that the centre of gravity of the whole engine is very little in front of the centre line of the main axle, if not actually to the rear of it. Let us suppose the latter to be the case, and imagine the engine to run over an obstruction on the rail. The direct result of an obstruction under the middle wheel is to increase the proportion of load upon this wheel and diminish that upon the leading and trailing wheels. If the obstruction were very serious—as high as the working camber of the springs—the whole weight of the engine would come upon the middle pair of wheels, and if the centre of gravity were right over the middle axle neither of the external pair of wheels would rest on the rail. According to the severity of any obstruction, then, the load on the extreme wheels would



be correspondingly reduced. If, however, the centre of gravity be behind the main wheel, as at *A A*, then any obstruction raising the middle wheels would raise the leading pair right off the rails, the whole weight being carried by the driving and trailing wheels, for the weight of the engine acting in the line *A A* of the centre of gravity cannot have any effect on the leading wheel, which is either lifted clear off the rail or so very much relieved of its load as to be in great danger of mounting the rail if taking a curve. Thus in every engine of this general design the middle wheel should be kept well back; or, to speak on general principles, the design should be such as to bring the centre of gravity of the whole machine between the leading wheels and the next pair, and well forward of the latter two, as at *B B*.

The success as a track keeper of the regular type of passenger engine, as now almost universal in America, and shown in fig. 2, lies in the fact that the centre of gravity is to the front of the mid-point of the compensating lever. An obstruction passed over by the wheel *D* raises the mid-point of the equalizer, but this point is to the rear of the centre of gravity, and the incidence of load on the truck remains unaltered, and there is developed no tendency in these wheels to mount the rails. The equalizer is of far greater importance in securing that the supporting point of the rear part of the engine shall be well behind the centre of gravity than it is as a mere equalizer of load.

Locomotive men are often apt to exaggerate the importance of equalization in this latter respect and entirely ignore the former, and they credit the equality of load of each pair of wheels with the track-holding quality properly due to the action pointed out above.

There is no mechanical reason whatever why the design of fig. 1 should not be altered to that of fig. 3, the driving wheels being "equalized" with the trailing wheels by a lever of unequal arms proportioned to give the desired weight upon the main wheels. In the best English practice this pair is loaded to over 40,000 lbs. Seeing that in the recent speed and endurance trials on the Scotch service engines with single drivers have proved best, their use is likely to extend, and probably they may soon be seen even in America, where the express traffic of the Eastern States affords scope for their introduction. If any superintendent is inclined to adopt them he should not overlook the advisability of the design in fig. 3 as regards the equalizing, by which the leading wheels are kept close down to the rails in event of any obstruction passing under any wheel to the rear of them.

W. H. BOOTH.

[Some comment on this letter will be found in the editorial columns.]

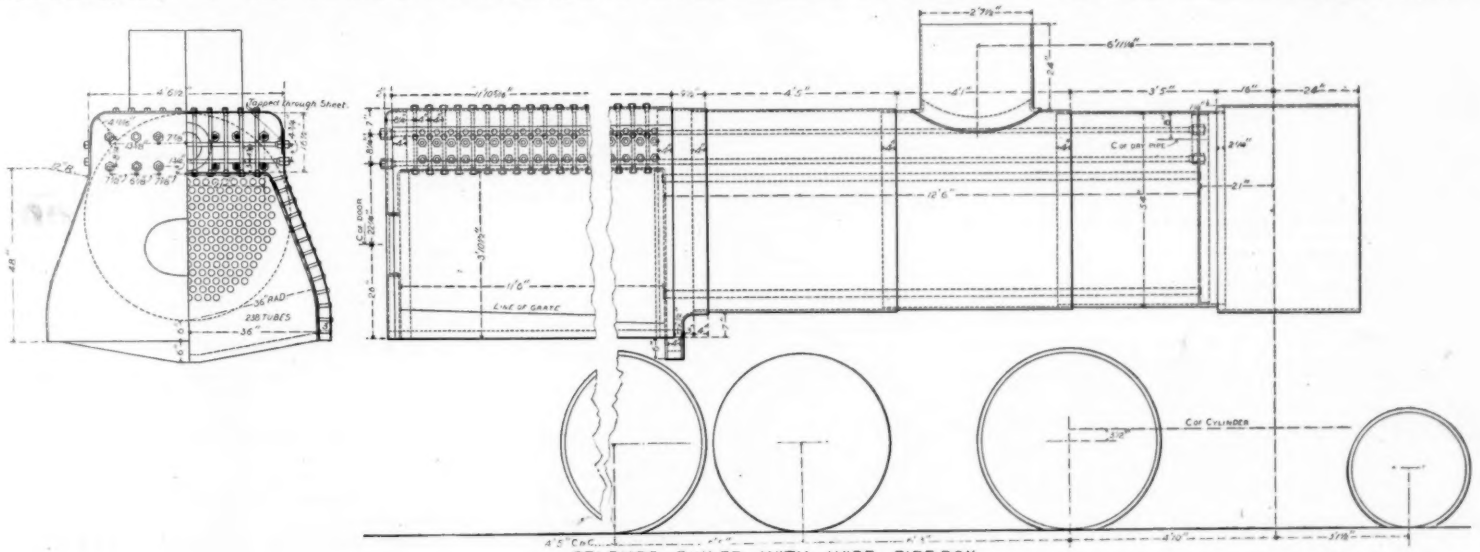
Belpaire Fire-box Boiler.

The illustration herewith shows a 54-in. straight top, Belpaire fire-box boiler, constructed at the Lehigh Valley shops, at Wilkesbarre, Pa., for use on consolidation locomotives. This boiler has large heating surfaces, and has made an excellent record in service. The following are some of the general dimensions not clearly shown in the cut:

Tubes, 2 in. diameter, 12 ft. 6 in. long.
Bottom of fire-box ring to bottom of lowest tube, 17 in.
Bottom of lowest tube to top of grate, about 12 in.
Top of crown to under side of outside fire-box, 16¼ in.
Width of grate, 72 in.
Length of grate, 11 ft. 6 in.
Water spaces, 3 in. wide at top and bottom.
Grate area, 69 sq. ft.
Heating surfaces in fire-box, 152.6 sq. ft.
Heating surfaces in tubes, 1409.7 sq. ft.
Total heating surfaces, 1562.3 sq. ft.
Ratio of grate area to heating surface, 1 to 22.9.

The stays in this boiler are placed quite close together, being only 4 in. from centre to centre. This is unusually close where nuts are used on both ends, as in this design. The staying throughout is excellent. The method of attaching the through stays is worthy of notice, there being nuts on both inside and outside of the boiler head. The same method of attachment is used for the cross-braces. In addition to the nuts on the inside and outside, the stays are also tapped through the sheets for the cross-stays.

The simplicity of the flanging of the sheets in this boiler indicates a minimum first cost.



BELPAIRE BOILER WITH WIDE FIRE-BOX.

Built at the Wilkesbarre Shops of the LEHIGH VALLEY.

Rail Flangers—Northwest Railroad Club.

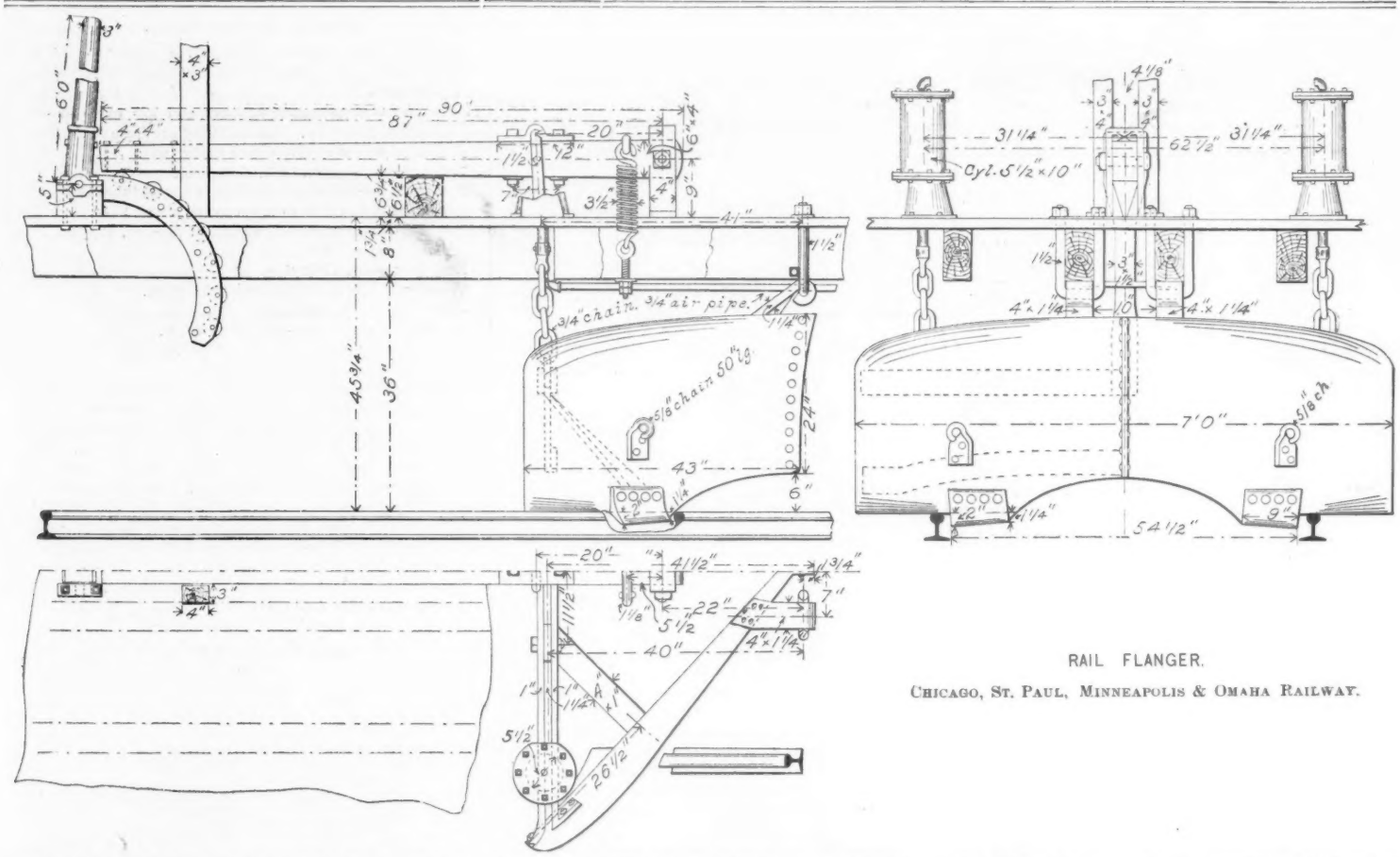
The second meeting for discussion of the Northwest Railroad Club was held in the directors' room of the Union Depot, St. Paul, Feb. 5, the President in the chair.

The discussion of the subject for the evening, "Flangers," continued from last meeting, was opened by the reading by the Secretary of a paper written by Mr. W. T. Reed (M. M. Chicago, St. Paul & Kansas City).

Mr. MATT ELLIS (M. M. Chicago, St. Paul, Minneapolis & Omaha), read a paper, of which an abstract follows. He gave a brief history of the flanger as he had seen it in use for 20 years, and followed with a description of the flanger, which is illustrated in this issue. This was introduced in the year 1882, and has been in continuous use since that date.

This flanger consists of a plow constructed of ⅜ in. boiler steel, which is hung under the centre of a box car and strongly hinged to the intermediate sills of the car and also connected with the car by safety chains, so that in case it is disarranged by meeting any obstruction it is not likely to be detached from the car. It is 7 ft. wide, so that it extends about 1 ft. outside of each rail. It is hinged in front, so that the rear which comes in contact with the rails can be raised when necessary to avoid obstructions. A heavy shoe or ice cutter, made of scrap steel from worn-out locomotive tires, is bolted on so as to extend two inches below the plow inside of each rail. There is a heavy oak timber extending lengthwise inside the box car to which the plow is connected by rods, and the plow can be raised by another lever with a cam, operated under the timber first mentioned. The plow weighs about 700 lbs., and additional adhesion to the track is secured by the use of two springs, which give an additional pressure of 500 lbs. The arrangement for raising the plow by hand power is only intended for use in case of emergency, and the special feature is the method of raising by compressed air or steam. For this purpose two upright cylinders are attached to the framing of the car, and the pistons are raised by pressure admitted at the bottom of the cylinders. The plan commonly adopted is to use an air-brake engine, the tender brake being disconnected by simply turning the four-way cock on the tender, thus making the brake inoperative. This enables the engineer to raise the flanger instantly by admitting air, by turning the engine's air-brake valve. On the release of the air pressure the flanger resumes its working position, falling by the force of gravity, assisted by the two springs which I have mentioned.

There is one point on which I think that you will all agree with me, and that is that no road can afford to neglect the use of some method of flanging track by power. The use of machinery is attended with as great advantages in this direction as in any other, and secures equal saving in expense and time and facilitates the dispatch of business in the same degree. On all railroads in this section there is comparatively little regular work for track laborers during the winter months, and economy requires that the force be reduced at this season. It is the practice to employ about three laborers to each section of six miles, and this force is entirely inade-



RAIL FLANGER.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA RAILWAY.

quate to do any effective work cleaning the flanges after a fall of snow. A fair estimate of the work which can be done is for each laborer to flange from one-half mile to one mile of track for a day's work. At this rate of work it would require at least three days for the ordinary force to completely clean the flanges, and during all this time the road is operated at great disadvantage. It is estimated that from five to seven more cars can be handled in a train when the flanges are clean than when in the condition they are left after the passage of the ordinary snow plow. It is practically impossible for the normal force of section men to keep the flanges of one of our Western roads free from snow.

The expense of running a flanger and locomotive 100 miles is about as follows:

Engineer and firemen	$5.90
Fuel, two tons	6.00
Oil and waste	.50
Use of locomotive and repairs	5.00
Wiper	1.25
Conductor and brakeman (if required)	5.00
	$23.65

At the lowest estimate this work would require 100 men working one day at an expense of $125—making a saving of $100 for 100 miles of road, besides the incidental saving in wear of tire and all the attendant advantages which come from a clean track. There is no comparison to be made between a road well equipped with appliances for keeping the flanges clean and one depending on hand labor to do this work. On the road with which I am connected we have 10 flangers ready for service, distributed at the different engine houses all over the line, and can easily flange the 1,400 miles of road in less than 10 hours.

During the past eight years it has been our practice to run from 28 to 35 wedge plows on our way freight and other freight trains every day during the winter season. Our snow plows are arranged so that they can be raised by screws, and they are run with the points raised when the snow is not troublesome. Should a snow or wind storm arise when the engine is in the freight service, the train is side tracked and plow dropped and track cleaned of snow. It is customary to run a flanger immediately following the snow plow. The engine attached to the flanger is then available as a "drag out engine," in case the snow plow should require assistance. The equipment which I have described has proved entirely adequate for removing snow and keeping the road open except in the case of unusual storms and in places very much exposed to the severe drifting winds of our prairies. These conditions we hope to meet by the use of the rotary plow, which I have no doubt will do the effective work which is claimed for it.

Mr. W. T. REED: I hope our club will do its best to bring forward the most important points in connection with the flanger and its working, with a view to simplicity, effectiveness, durability and cheapness. I would suggest as follows:

1. That flanger be located in front of engines and attached to pilots in such a manner that they can be easily repaired.

2. That the knives or cutters be made out of second-hand spring steel, with the cutting edge tapered and set slightly forward, and secured to the frame of the flanger in section and bolted, so that should the section next or inside of rail get broken, it can be easily removed and replaced by another section; the engineer to carry a supply.

3. I would recommend the Temple or Priest flanger. One is worked from a fixed point near point of pilot, with slot to allow for curves. The other raises and lowers bodily, and will take more snow from the centre of track, but is less adjustable on curves.

4. I would recommend flangers to be raised and lowered by air, and should the air give out provision should be made so that the flanger will still raise.

5. The flanger should be provided with a pan or chute that will throw snow from track.

6. All passenger engines on roads troubled with snow should use a flanger, which can be so constructed as to take the place of the pilot plow.

7. Should flanger cars be used, I would recommend the Ellis or Goulette pattern. One is hung from the centre of a box car, and worked by air or lever, the other is hung at both ends of the car so that flanging can be done running either way, and so save the reversing of the same on table. The raising and lowering can be done by air, and worked by the engineer.

Mr. A. F. PRIEST (M. M. Eastern Ry. of Minnesota) showed blue prints of his flanger and said: Prominent among the objections raised to locomotive flangers is the danger through knives dragging on the rail when in working position. Another serious objection is displacing torpedoes. These two objections are obviated in my flanger by supporting the rear end of the flanger frame on the engine truck equalizers when in working position, whereby a very nearly even depth of cut is secured for the rear knives. The forward end of the knife frames being hung to the point of the pilot, the depth of cut varies on account of the action of the engine springs. This, however, is unimportant, as it is not desirable to cut lower than one or two inches above the top of rail at centre of track. I have found in this flanger that it is quite unnecessary for it to ride the rail in order to do good work in the hardest snow or snow mixed with sand or soil and densely packed. I have therefore arranged the knives to clear the rail both outside and inside at the greatest lateral movement of the engine. Perfectly satisfactory results are obtained with knives arranged to clear the rail at the greatest lateral motion of the engine. By observing the action of the ordinary style of pilot flanger having the front end suspended on a pin, it will be seen that, in rounding sharp curves where the lateral travel of engine is greatest and most violent, the outside flanger will jump up on the rail, if the notch is not sufficiently cut or worn out, thus proving that the slot in the front end is insufficient provision against lateral motion. I have never yet seen one of these flangers move ahead in slot when coming in contact with the rail, but always either jump the rail or, if sufficiently pliable, double back. My method also enables us to present the cutting knives to the snow at the most advantageous angle, and to hold them rigidly to that position where they must either cut or break, in which case no harm is done, as the frame supporting knives is always carried above danger by means of the equalizer, and is sufficiently strong to stand the shock. The knives being in sections of four on each side secured by studs are easily and quickly replaced. It is obvious that all snow lifted by knives is deposited outside the rail, as by means of side sheets we have one continuous face from the lower cutting edge of the knives to the top of the side sheet.

This flanger is especially designed for an eight-wheeled engine, as in this class less lateral motion exists and the equalizer principle can always be used. In cutting pure ice it has had no trial, but could be made sufficiently strong to do that. Snow packed to its greatest density as from long continued walking or driving over is removed with greatest ease. No power whatever is necessary to hold it down to the work. The total weight of that portion of flanger supported on equalizers and nose of pilot when in working position is 599 lbs. The cost exclusive of air brake cylinder for lifting would be about $60. An independent lift in the form of a small winch in corner of cab can easily be attached for use in case of failure of air. I used the winch lift alone on the same flanger last winter, and fonnd it satisfactory and reliable in every way. The expense, however, of this extra lift added to the cost of an air brake cylinder would provide an engine with a small steam cylinder, which on the whole would prove more satisfactory.

Mr. LEWIS: The best I have got is a flanger on paper. I am impressed with the idea that the place for a flanger is not on the front of the engine. The flanger that I have designed is connected to the rear truck frame. It has a shaft similar to the tumbling shaft of a locomotive suspended on bearings bolted to the bottom pedestals. The height of the truck and flanger is preserved by block ng on top of the truck boxes. The flanger consists of a timber, 4″ × 12″, with plates of $\frac{5}{16}$ iron, shaped like the mold-board of a plow. The length of the mold-board is 2 ft., cutting an equal distance inside and outside of the rail. This is connected with an air cylinder that is bolted to a timber that is transverse of the engine frame. The connection of this cylinder is with pipes both at the bottom and top of the cylinder, and by a slight change in the construction of the present engine valves you are enabled to admit air alternately to either end of the cylinder to raise and lower the flanger. I would suggest that the cutter that is used to remove the snow and ice from the flanges be made light enough, so that in case it struck an obstruction, or in the event of the flanger not being raised in time for a crossing or guard rail, the cutter will break before doing any damage to the flanger. The principle that I have mentioned of admitting air alternately from either end of the cylinder I have seen already applied to a differently constructed flanger.

The object of attaching it to the rear truck frame, immediately following the wheel, is that you can cut the snow and ice more closely to the rail than than you can by attaching it to the pilot, or at any greater distance from the wheel, as it naturally follows the track of the truck wheel. There is a stop to regulate the travel of the piston and a set screw arranged so that you cannot get too great a pressure upon the rail. There is a spring to raise the flanger in case of a failure of the air. The cutter is held down by air pressure, and if it should be found that the pressure is too high, a relief valve might be placed in the pipe. There is no lateral motion because it is so near to the truck wheel and it will naturally follow the curve in the track. I would give some little lateral play.

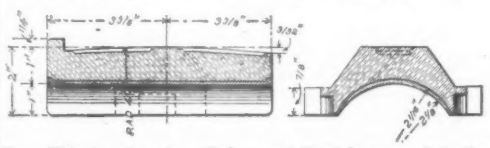
In the informal discussion which followed, Messrs. C. F Ward, Matt. Ellis, J. J. Ellis, W. H. Lewis, J. O. Pattee, J. C. Barber, A. F. Priest, the President and the Secretary took part.

Union Pacific Journal Brass.

The journal brass illustrated herewith shows the method of lining used on the Union Pacific. The body of the brass is made of ingot copper, tin and zinc, in the following proportions: 80 parts ingot copper, 10 parts tin, 10 parts zinc; total, 100 parts

This brass is lined with an alloy composed of antimony and lead in the following proportions: 25 parts antimony, 75 parts lead; total, 100 parts.

The thickness of the lining is about $\frac{3}{32}$ of an inch, as shown, being a little thinner at the sides than at the centre. The weight of this brass when complete, ready for use, is 9



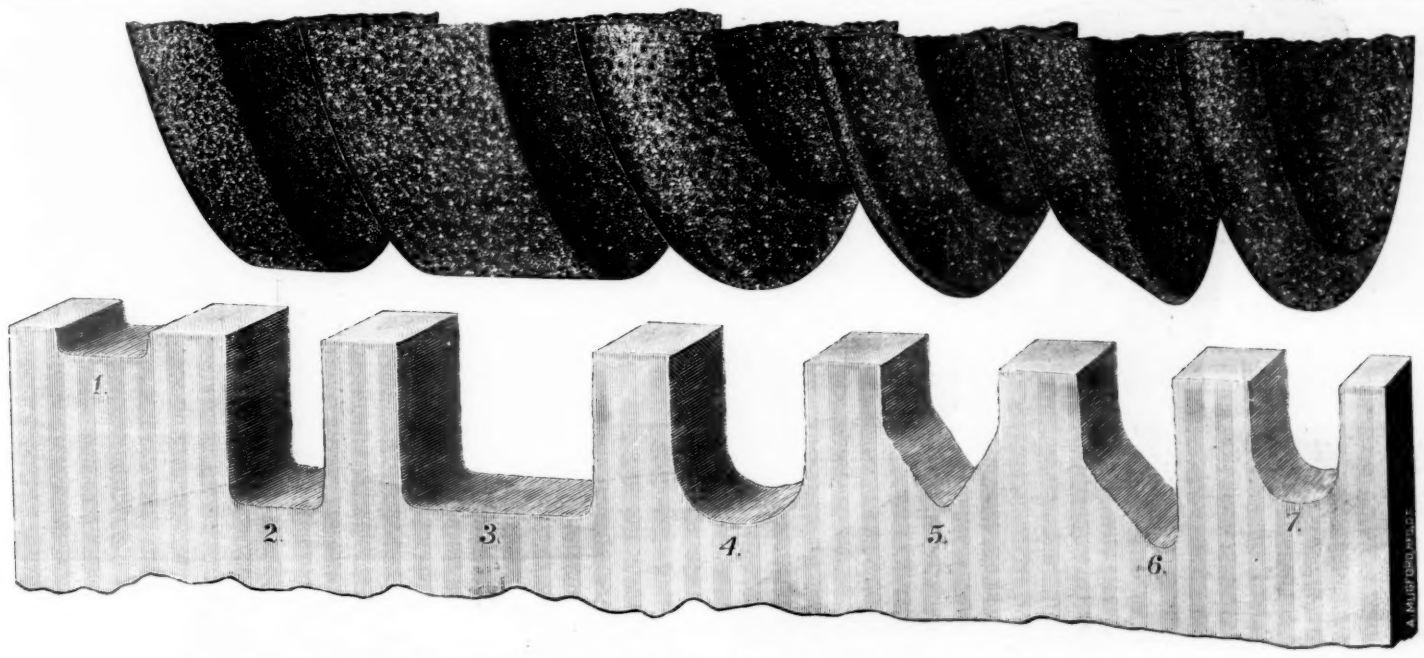
lbs. This is what is called a soft-lined brass, and is the kind referred to as a "soft bearing" in the discussions following a paper on the subject of anti-frictional journal bearings read at the Western Railway Club at its January meeting.

Emery Wheels and Files.

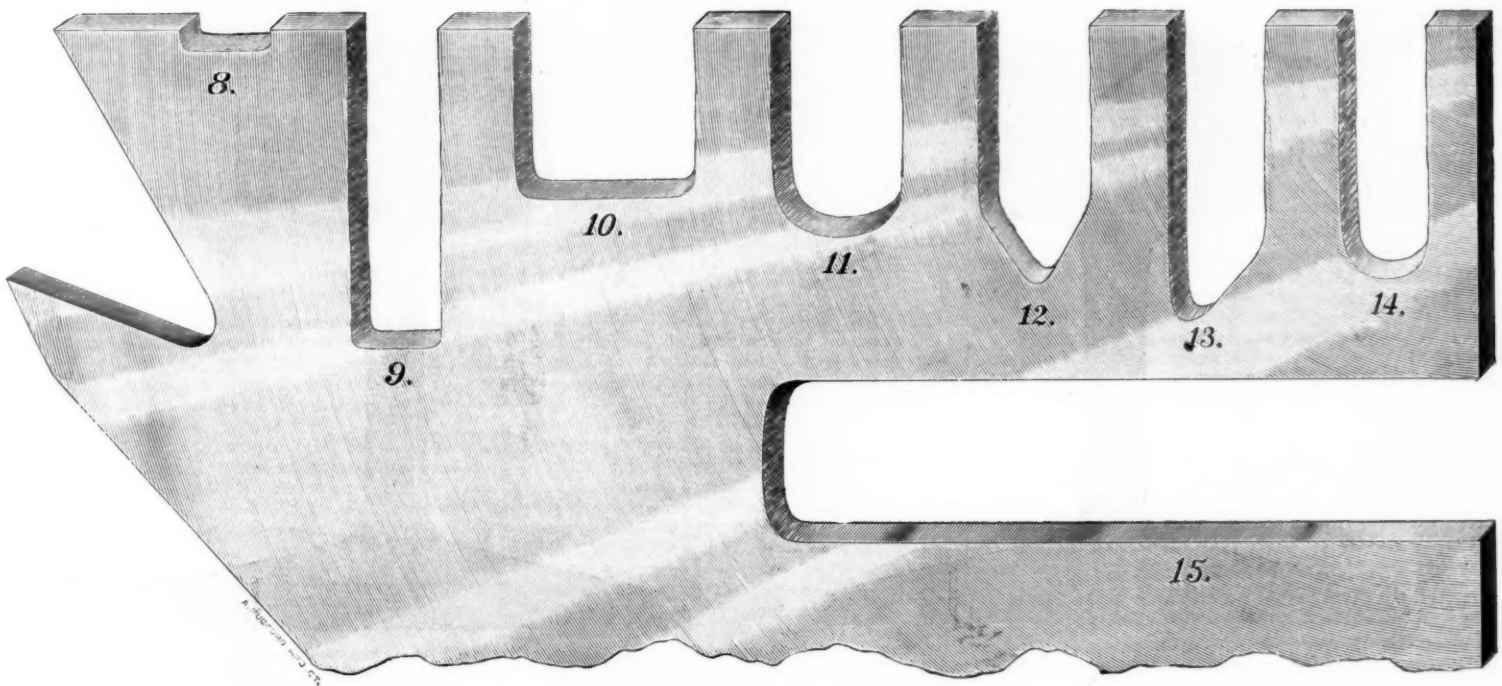
In the *Railroad Gazette* of May 27, 1887, was published an article on "The Comparative Economic Value of Emery Wheels and Files." This article showed that as a result of many hundreds of trials the maximum cost of grinding off cast-iron with a solid emery wheel was 11.6 cents per lb., and the minimum cost 2 4 cents per lb. The cost of filing off cast-iron was stated to be from 35.9 cents to 37 cents per lb. The cost of grinding saw steel was given at 28.9 cents per lb., and of filing saw steel at 206.4 cents per lb.

The cost of grinding is modified by the quality of the emery wheel used, and by the conditions under which it is run, and therefore varies often and greatly. A very soft, free cutting emery wheel will grind off metal with great rapidity, but will wear out rapidly. A hard wheel will grind more slowly and wear out more slowly. To get at the cost of product, the price of labor and of wheel must be specially calculated for each case.

A wheel only ½ in. thick, mounted on a small, light and ricketty machine, and run by loose, narrow belts, will do but a moderate amount of work. A wheel 3 in. thick, so mounted that it is perfectly centred and runs with so little vibration that wheel and metal to be ground



COMPARATIVE CUTS BY A FILE AND BY EMERY WHEELS IN A CAST-IRON PLATE.



COMPARATIVE CUTS BY A FILE AND BY EMERY WHEELS IN A CIRCULAR SAW.

can be kept in continuous contact, and so belted that the wheel maintains undiminished its standard speed, such a wheel will do a large amount of work.

In an article on "Solid Emery Wheels," published April 24 in the *Scientific American Supplement*, No. 538, the greater weight of British emery grinding machines, as compared with American, was indicated, and a strong plea was made that grinding machines should be much heavier and stiffer, in order that greater safety might be insured and the injurious vibration of floors, etc., decreased. The result of numerous experiments ranging through many years is to indicate that the use of much heavier machines would lead to an increased product of the wheel and a greatly lessened cost of work. To get the maximum product from any emery wheel, the metal to be ground must be in *continuous contact* with the wheel. If this is secured, a mile's length of cutting surface passes over the metal in one minute. In countless cases a continuous stream of sparks deludes the workman into the belief that he has continuous contact, while, in fact, owing to the light weight and unsubstantial setting of the machine, a rhythmical vibration has been set up, which leads to discontinuous contact, so that only a part —and sometimes only a very small part—of the wheel comes in contact with the metal.

It is the object of this article to illustrate and to enforce pictorially the enormous disproportion between the product of the emery wheel and the file—the unsubstantial machine and the substantial one. In this case the weight of metal removed was not ascertained, and these tests cannot be closely compared with those given in our preceding article. By themselves, however, they stand as an instructive lesson.

Figs. 2 to 7, both included, show in exact size and shape the cuts made by a set of tanite emery wheels in a cast-iron plate ⅛ in. thick. Each cut was ground out in 60 seconds. Fig. 1 shows the cut made in same plate in 60 seconds by an expert filer, using an entirely new file with cutting surface of same width as that of wheel which cut slot No. 2, viz., ⅛ in.

Figs. 9 to 14, both included, show in exact size and shape the cuts made by same set of wheels in a circular saw of No. 9 wire gauge, American standard, viz., ⅛ in. scant, or 3 millimetres thick. Each slot was ground out in 60 seconds. No. 8 shows the slot made by a new file in 60 seconds In the cast-iron plate slots 1 and 2 correctly indicate the comparative work of tools of same width. In the saw steel, 8 and 9 should be compared. As indicated in our previous article, neither filer nor grinder can maintain the one-minute rate of work for any length of time, and it is not possible yet to state in what proportion the rates would decrease or what would be a fair day's average for each. It is proved that the filer's rate decreases much more rapidly than the grinder's. It was *hard work* on the man to file slot No. 8 in 60 seconds, and the teeth of a new file which was used in cutting this one shallow slot were worn dull. As demonstrated by Nos. 8 and 9, the emery wheel did about 16½ times as much as the file.

The emery wheels used in cutting the slots shown in these illustrations were tanite wheels, class 2. This class is of emery neither very fine nor very coarse, and it is neither the softest nor the hardest of various qualities. It is selected as a compromise or average wheel. These wheels were mounted on a grinding machine weighing only 44½ lbs., the machine standing on an ordinary wooden vise bench, and driven by a 2-in. belt, running so loosely that belt slipped and speed of wheel was variable.

We now call attention to slot No. 15. To grind this out, an old tanite wheel, soft and free cutting, but of unknown class, was picked up in the shop. This wheel was mounted on a machine weighing 662 lbs., standing upon, and bolted to and through, a mass of stone and concrete over 3 ft. deep and was driven by a 4 in. belt, a tightener pulley being so used as to prevent all slip and to maintain the maximum speed. This slot was cut in *only 30 seconds!* If it were the same width as slot No. 8, it would show that the emery wheel had done 63 times as much work as the file; but as it is $\frac{1}{16}$ in. wide, the work done is actually 126 times as much.

Steel Rails—Specifications, Tests and Inspection.

The discussion of this subject by engineers and rail makers which appeared in our issues of Jan. 18 and Jan. 25, and in various issues of the *Iron Age*, is continued by Capt. R. W. Hunt in the following reply to some of the criticisms which were made to his specifications. We have taken the liberty of abbreviating his communication somewhat, and have omitted several of the illustrations which accompany it. The full text and all of the illustrations will be found in the *Iron Age* of Feb. 7.

In preparing my specifications I realized that I should not present any new or startling theories or discoveries. I did not attempt it. It happens that I have devoted many years to the manufacture of iron and steel, and that steel rails have formed a large percentage of such product. I have made some very good rails, and some of which I was not so proud. I believe by following the rules which I have presented in my "specifications" many failures can be avoided. And this can be accomplished without necessitating the alteration of existing plants or materially increasing the cost of manufacture. Each section [of the specifications] is based on ascertained facts, proven by practice. There is not an unsustained theory in the whole 21 sections.

The proposed system of test pieces is one which I had successfully used at Troy for many years, not only in making rail steel but with various other kinds, ranging from 0.05 to 1 per cent. of carbon. I fully appreciate the effect on these test bars of different modes of treatment, and also the results obtained by greater or less work; hence I provide that: "These test ingots shall be 3 × 4 in., and not less than 4 in. long. From these bars at least ⅛ in. square shall be drawn at one heat by hammering." I provide that tests shall be made from ingots representing different parts of each heat, so as to detect any irregularity in the steel, should it exist. I do not propose that these bars shall be prepared

Fig. 1.

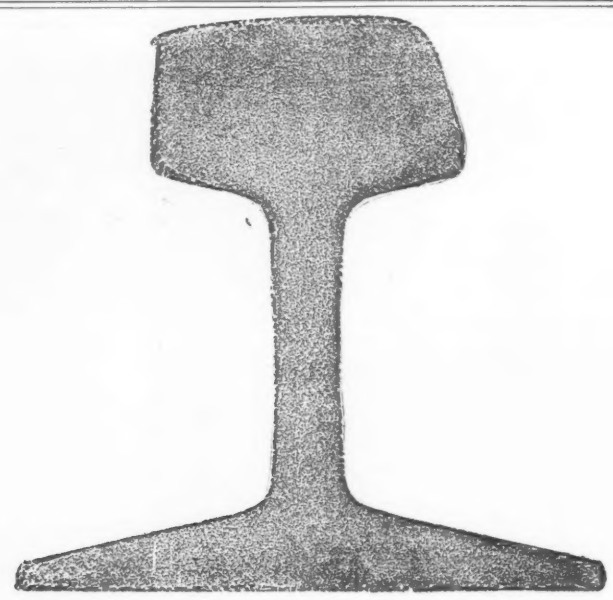


Fig. 2.

Ultimate strength, 85,950 lbs. per sq. in. | Elongation, 15.62 per cent. in 4 in.
Elastic limit, 42,780 lbs. per sq. in. | Reduction of area, 43.40 per cent.

Fig. 3

Fig. 4.

by anybody, but assume the mills, for their own protection, will detail suitable men.

I prefer this plan to drop tests made of rail ends because I believe it to give equally accurate results and to have the advantage of checking the work before the steel is in a finished rail. To use the drop test, under the system pursued at several of the American mills would seriously interfere with their present system. At these the rails are loaded on the shipping-cars as fast as they leave the drills, both day and night. It will be easily seen that if they were to be held until rail ends from the first and last ingots had become cold enough to test under the drop serious interruption would occur. Then, again, neither railroad engineers nor railmakers are perfectly in accord as to which drop test is the proper one.

I do not offer my test bar as a means of determining the "wearing qualities." I only adopt it as a safeguard against steel so hard as to be dangerous.

In defense of Section 10, I submit photographs taken of ingots which had been kept in an upright position until the interior steel had solidified, and of others which had been placed on their sides as soon as possible after casting. For these I am indebted to Mr. Robert Forsyth, General Manager Union Steel Co., Chicago. He had two ingots from several heats treated in these two ways. These ingots stood next each other in the pit, and had been cast under as nearly the same conditions as possible. When cold they were broken under a drop. Of course, had they been cut in two a better exhibit would have been made; but they tell the story as they are, and cutting would have been much more expensive. It is true Mr. Forsyth was fully convinced of the error of too hurriedly placing ingots on their sides, and no doubt these specimens may be exaggerated examples. Granting this to be true, they nevertheless show what can happen and a danger to be carefully avoided.

To prove that such things do happen in actual practice, I submit the section of a rail which broke in the track, fig. 1. The ingot from which this was made had most evidently been too quickly removed from a vertical position. Railroad men have seen hundreds of such rails. They may not have actually broken in service, but have failed by crushing. A few months since I happened to be in one of the yards of the St. Paul, Minneapolis & Manitoba, near St. Paul, when they were putting in a siding, and were using for the purpose old rails which had failed in service by cutting from them whatever lengths of sound steel were possible. Among some 50 rails so treated, I saw at leat six showing such defects. Some of them did not come so near the surface as the one illustrated, because the chilled wall of the ingot had been thicker. In other words, the ingot had not been disturbed so soon after casting.

The etchings of rails, figs. 3 and 4, for which I am indebted to Mr. F. A. Delano, of the C., B. & Q., plainly exhibit the same interior defects, but in a modified form. It may be said that, even though the interior of these rails is not absolutely solid, it will not affect their wear. Perhaps not, but you are near the danger lines, and I should much prefer a rail showing such a fracture as fig. 2, also given me by Mr. Delano, illustrating one which had yielded good service in the track of his road; and I am happy to say it is an American rail.

In defense of the five years' guarantee clause I can only say that it is taken almost verbatim from the one given for many years past by the rail company which produced in 1887 the largest tonnage of any of the American mills.

My specifications do not provide any chemical composition. On the contrary, in view of the test bars and the guarantee, I leave that to the makers, and so distinctly state in Section 8. This statement also answers the critic on the carbon question. And my previous remarks in defense of the test bar also apply here, adding that I prefer bending by the blows of a sledge, because it gives just the kind of a shock wanted to make the test of the most value. I can successfully bend steel over a former which will break if treated the other way.

The photographs of broken ingots give the information desired in reference to Section 13. Mr. Forsyth's ingots were taken out of the molds and pits the very instant they were set sufficiently to be handled, and were cooled in the air. The desire to so treat them caused too much haste in finishing the pouring. In other words, the casting ladle was not used long enough as a sink-head; hence the cavities at the upper ends of the vertical ones are exaggerated. But that defect is always there to a greater or less extent. This is also largely controlled by the chemical character of the steel. An ingot is a steel casting. Any maker of such castings in finished form can tell you of the character of their top ends. In their practice they make these ends sink-heads and cut them off.

I know of mills where other than heavy rail sections are also made, and it has been their custom to cut off the top end of their ingots with as little waste as possible, and then let any surplus which may exist after cutting the regular rail lengths go into short blooms for light rails. They cut them 12 in. or "greater length preferred" from the bottom or soundest end of the ingot. Perhaps they may never have had trouble from failed ends of their rails. If so, somebody has been pirating their brands.

I thank my friend for his complimentary indorsement of my capacity as a Bessemer steel man, but cannot see that anything but correct eyesight and common sense, added to familiarity with rail making, would be necessary to fit a man to know whether or not rails were being produced in accordance with my specifications.

Let me state most distinctly that I do not propose interfering in the manufacture, do not propose to "run" anybody's works. If it is decided that certain things are not to be done, I propose to assist the makers in carrying out their contract by calling their attention to every time they are done. And I believe a person independent of the mill's personal influence, the pressure of which cannot be realized by any one who has not had personal experience with mill operatives, can do the best. Rails are produced in America at about the rate of one a minute. The men are paid by the ton or piece, quite a small amount for each ton, but making good wages by a large aggregate.

You have received answers from five makers. Two of them give me strong indorsement. Another "heartily subscribes to most of what" I recommend. Another disagrees with many of my points, and the other does not see much good in me. I think I can at least claim a "plurality." Calm discussion should lead to good results, and I am certain that both rail makers and users have cause to thank the *Railroad Gazette* and the *Iron Age* for their great services in securing the attention and views of so many distinguished representatives of both sides.

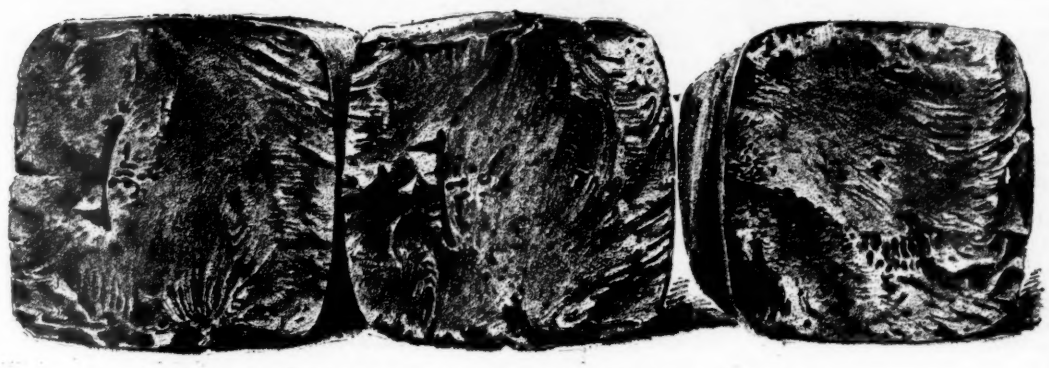
Explosives.

Mr. W. H. Deering lately read before the Society of Arts (London) a review of the progress made in explosives since 1875. What follows is chiefly drawn from that paper.

Gunpowder.—Brown or cocoa powder was introduced in Germany in 1882. The cannon powders of England, France, Germany and Austria vary in composition, having from 74 to 75.5 per cent. of potassium nitrate, 10 to 12.5 per cent. of sulphur, and from 16 to 12.5 per cent. of charcoal. The brown powder has, by Heidemann's patent, 79 per cent. of potassium nitrate, 3 per cent. of sulphur and 18 per cent. of charcoal, obtained by carbonizing straw until it is brown, when it is powdered.

Used in the prismatic form, the brown powder (for equal velocities imparted to the projectile) produces less pressure

FRACTURES OF STEEL INGOTS COOLED STANDING ON END



FRACTURES OF STEEL INGOTS COOLED LYING ON SIDE.

and less smoke than the black powder formerly used, giving a greater quantity of heat and a less volume of permanent gases. The products of combustion are more thoroughly oxidized in the case of brown powder than with black powder, the latter producing a considerable quantity of potassium sulphide on explosion.

Amide Powder was patented by F. Gaens for use in guns and for blasting. In it the sulphur is to be replaced by an ammonium salt, so that on ignition a potassamide, which is volatile at high temperatures, is formed. The proportions mentioned are: 101 parts, by weight, of saltpetre, 80 parts of ammonium nitrate and 40 parts of charcoal. The patentee states that this powder produces much less smoke, less residue and no gases injurious to the gun.

Gun Cotton.—No marked improvements in this explosive have appeared since the patents of Sir Frederick Abel. A mode of waterproofing the cartridges by immersion in either acetic ether or nitrobenzine and exposure to the air, when the gun cotton becomes coated with a thin and hard skin of dried partly dissolved gun cotton. This is intended either to keep water in or out of the gun cotton, as is most desirable; but as cracks sometimes occur in the coating it has been found necessary to use an additional coat of paraffin.

Nitroglycerine.—The most noteworthy invention is that of Mr. Nobel, *Blasting Gelatine*, which is composed of about 93 parts by weight of nitro-glycerine and 7 parts of nitro-cotton, that is less highly nitrated than gun cotton. The nitro-cotton is dissolved in nitro-glycerine at a temperature of 95 deg. F. It does not break up or part with its nitro-glycerine in the presence of water like dynamite. Its explosive power is about one-half greater than that of 75 per cent. dynamite, or No. 1, but it requires a stronger detonator.

Gelatine Dynamite is composed of a thin blasting gelatine, (97.5 nitroglycerine and 2.5 per cent of. nitro-cotton), and a combustible mixture of potassium nitrate, 75 per cent.; wood meal, 24 per cent., and sodium carbonate, 1 per cent. Two grades of this are made, No. 1 with 65 per cent. of gelatine, and No. 2, with 45 per cent. *Gelignite* is a varian on the above, both in the proportion of nitro-cotton and wood meal. All of these are elastic gelatinous substances which will bear immersion in water without parting with their nitro-glycerine.

The theoretical reason for the greater explosive force of blasting gelatine over pure nitroglycerine is that the latter contains an excess of oxygen, and nitro-cotton a deficiency; the combination of the two results in perfect combustion.

Carbo-dynamite, consists of eight parts, by weight, of nitroglycerine with one part of cork charcoal, which seems to have remarkable absorbing powers, it being stated that no nitroglycerine is separated from this preparation by an immersion of several months in water. Mr. Borland, the patentee, claims that the addition of 3 per cent. of cork charcoal to Keisselguhr (No. 1) dynamite will allow it to retain its nitroglycerine when immersed in water. And further, that by kneading carbo-dynamite with one part its weight of water an uninflammable dynamite is obtained which can be exploded by a suitable detonator, but detonates without flame, rendering it a safe explosive for use in coal mines.

Explosives for Coal Mines.—Experiments lead to the theory that only those explosives attaining a heat of 3,992 deg. F. or more can cause the explosion of fire-damp. Ordinary dynamite gives a temperature of 5,324 deg. F.; nitro glycerine, 5,738 deg. F.; gun cotton, 4,777 deg. F., and various expedients have been adopted to decrease the heat of the detonation without diminishing, too much, its force. The "water cartridges" in which, with explosives of the gelatine-dynamite type, the volume of the water envelope must be at least four times that of the explosive, is the best known of these. Various patents have also been taken out for mixing salts, containing a large amount of water of crytallization with the ordinary nitro-glycerine explosives. Soda crystals ($Na_2CO_3 10 HO_2$), sodium sulphate, or, for use in warm climates, as less liable to lose its water, magnesium sulphate; containing respectively, 62.9, 55.9 and 51.2 per cent. of water of crystallization so combined that the resulting compound shall contain from 15 to 65 per cent. of the hydrated salt made into cartridges and used as "fire-damp dynamite" have proved more or less satisfactory.

Panclastite is a mixture of carbon disulphide with nitrogen teroxide, the substances being mutually soluble. This is stated to be a powerful explosive, but the presence of sulphurous acid in the gases render it unavailable for underground work.

Hellhoffite, the name of which is not so profane as at first sight appears, being from the name of Hellhoff, of Berlin, may be composed either of 1 part, by weight, of dinitrobenzine and 1.5 parts of nitric acid, or of 1 part nitrobenzine and 2.5 parts of nitric acid, proportions depending on the deficiency of oxygen in the two bases. Suitably primed, hellhoffite is a very powerful explosive, but Sir F. Abel thinks not as powerful as blasting gelatine.

Favier's Explosive and the following are analogous to the preceding one, only the nitric acid is replaced by ammonia nitrate or other nitrates. In Favier's explosive, either ammonium nitrate or sodium nitrate are mixed with resin and nitronaphtbaline, kneaded together warm and pressed into cartridges, which are coated with a solution of lac or resin.

Bellite produces its maximum effect when composed of 15 per cent. dinitrobenzine and 85 per cent. ammonium nitrate. The mixture is effected in a drum heated by steam to between 122° and 212° F., the nitro compound melting and coating the ammonium nitrate. Some recent trials in the Cleveland (Eng.) ironstone mines show that it is capable of doing a large amount of work, its action extending over a large area, its rate of detonation being comparatively slow.

Roburite differs from the preceding in the use of *chlorinated* nitro-derivatives of aromatic hydrocarbons, or phenols in admixture with a nitrate. The roburite actually in use is believed to be a mixture of chlorinated dinitrobenzine with ammonium nitrate. There appears to be a useful field for it in coal blasting, where a claim of safety is made.

Romite and *Kinetite* are little known and little used explosives.

Rackarock is a compound which was used in the blasting of Flood Rock, among other instances, in this country. As used there it was composed of 21 per cent. of nitrobenzine and 79 per cent. of potassium chlorate. [The rather excessive amount of blasting required in this case to break up the rock so that it could be dredged after the main blast was fired is not understood to be due to any lack of efficiency in the rackarock employed, but rather to uncertainty as to the effect of firing so large a quantity of high explosives in charges which were so near to each other.—EDITOR.] The nitrobenzine and potassium chlorate are not mixed until a short time before use, thus diminishing danger of accidental explosion. The inventor of carbo-dynamite proposes mixing 5 per cent. of his cork charcoal with this explosive, claiming that it will make the mixture plastic and increase the rapidity of detonation.

Picric Acid, when detonated by about 23 grains of fulminate of mercury, is a powerful explosive. It is prepared for use by melting at 246 deg. F., or agglomerated by collodion and molding. The cast acid has a specific gravity of 1.6 or 1.7, which gives it an advantage when comparison is to be made by volume. The picrates of lead and potassium, which explode on being heated, have been used for industrial purposes, but have proved too dangerous.

Mr. Deering concludes with a notice of *Ammonio-nitrate of copper*, which has lately been found to be a powerful explosive when fired by a fulminate detonator. It is possible that some of the inexplicable explosions of old copper and brass gas service pipes may be due to the formation of this salt.

Brake Tests.

On the 5th inst. Mr. M. J. Rogers, Master Mechanic of the Chicago, Santa Fe & California made at Chillicothe several tests of the operation of the automatic air-brake on a long train. The train consisted of 60 empty coal cars, of which about three-quarters were new. These cars were taken indiscriminately from the yards of the Chicago, Santa Fe & California. Out of the 60 cars 45 had brakes suitable for operation; on 15 of the cars the brakes were out of order. The cause of this was no fault of the brake devices, but was due to the fact that the car manufacturers, who applied the brakes, did not blow out the piping before putting on the triple valves.

These cars were fitted with both the old and the new styles of triple valves in the ratio of two quick-acting new valves to one of the old style. The engineer's valve was of the new model with the auxiliary drum. The locomotives used were two 10-wheel "Baldwins," with 10 × 24 in. cylinders.

These engines pulled the train about 8 miles up a grade, and while on the return trip the tests were made. The first emergency stop was made at a speed of 16 miles per hour, in 280 ft. The second stop was made on a down grade, when the train broke in two. During the first stop, one truck was knocked out of place from under the car, one draw-bar and one hanger-pin in the truck were broken. The shocks were so great in the way car that all the window glass and signal lanterns were smashed, and all the observers in the car were thrown from their feet. During the run down the hill, of 8 miles, the train, while making a common stop, broke in two. This was caused by the breaking of a draw-head. The whole train was then backed four miles to a siding where the draw-head was repaired. Later, while slacking the train with the air brakes, the train again broke in two. To make a run of 8 miles down the hill consumed two hours time.

It was stated by those who were present that the cars were bunched in a most disastrous manner, and if the cars had all been old ones a serious wreck might have occurred. Comment upon this will be found in the editorial columns.

Mr. Sandberg on Heavy Rails.

We have received in pamphlet form the full copy of a paper read by Mr. C. P. Sandberg before the Institute of Civil Engineers (London) last October, on the Use of Heavier Rails for Safety and Economy in Railway Traffic.

The author first gives a brief history of the Goliath rail. With this our readers are already familiar. The section of the heavy Sandberg rail, as modified by the engineers of the Belgian state railroads, was shown in the *Railroad Gazette*, March 18, 1887. That rail weighs 105 lbs. per yard. The first order was for 300 tons, placed with the Cockerill Works toward the end of 1886, and the rail was rolled with perfect success, and was so satisfactory in all respects that a second trial was made of 1,000 tons, put down in the year 1887. Early in 1888 it was decided to order 10,000 tons, in order to extend the use of this heavy rail to various lines having heavy gradients and operated at high speeds. This order has now been executed, and it is said that a still further order of 3,000 tons has very recently been placed. No other railroad company in Europe has yet tried so heavy a section, but the Northern of France has begun the use of a rail of 86½ lbs. per yard, replacing a 60-lb. section. Mr. Sandberg briefly notes the recent increase of weight of rails in the United States. He considers that the qualities of American ore require even a heavier rail than that made in England.

Mr. Sandberg considers it to be a fact that steel rails be-

come more brittle under the hammering of service, independently of the diminution of their substance by wear, and considers the effect of cold as of great importance. He holds the theory that iron and steel rails are weakened by very low temperatures, and gives a table of tests made by him in the year 1888 in Sweden, which goes to confirm this theory.

The railroad authorities of that country, with a view to getting greater wear, had ordered rails with 0.4 per cent. of carbon. The imported English rails previously used contained on an average 0.3 per cent. of carbon, and very few have been broken in 20 years service. It was found that the tests specified and considered necessary for safety broke half the rails tested during the winter season, and it was decided immediately to return to 0.3 per cent. of carbon. The tested rails had been cut in two and the halves of them not tested were kept for a similar trial in summer. The results of these two trials are shown in the table. One lesson which the author draws from this table is, that it should be as a warning to engineers not to copy specifications from other countries in which the conditions vary.

The influence of the form of the section upon the admissible hardness of the material, is also considered important. A double-headed rail can be made harder than a flange rail with a thin wide flange, especially so because of the unequal cooling of the different parts of the rail. Therefore, it would be dangerous to take the experience of the double-headed rail and apply it to flange rails.

Mr. Sandberg shows a number of typical sections from various countries. The American sections show wide and thin flanges, comparatively, while in those of the Continent the section is made proportionately higher, with a narrow base. The author considers the American practice in this respect erroneous, at least from the standpoint of the rail maker, as it increases the difficulty of rolling and disposes the metal in an unfavorable shape to resist blows. He considers the double-headed English section, laid on a broad chair as the best type, inasmuch as it allows the rail to be hard without risk of fracture and affords a good method of fastening it to the sleepers with a large bearing surface, but he thinks that the cost will usually prevent the general use of this section outside of England.

In order to secure sufficient bearing surface, and at the same time use a rail with a comparatively narrow base, Mr. Sandberg would either use metallic sleepers or a steel tie-plate, and he gives in this pamphlet a proposed plate, designed for the Swedish railroads, weighing 10 lbs. and giving a very large bearing on the tie. This plate has two clips cut in the metal and turned up to receive the rail flanges. These clips are set diagonally, so that when the plate is inserted under the rail and is turned to bring its long axis perpendicular to the axis of the rail, one clip engages the flange on each side. The rail and plate are held in position by spikes.

This plate is designed to give the rail a cant of 1 in 20, although Mr. Sandberg does not commit himself as to whether or not it is desirable that the rail should have any inclination from the perpendicular. The Goliath rail is laid without cant and with a base-plate of 5 × 9 in. On the Danish state road plates of 7 × 8 in. are being used with 63-lb. rails. On various Continental roads tie plates are being adopted. Mr. Sandberg would have the plate at least 7 in. in one dimension by from 10 to 15 in the other.

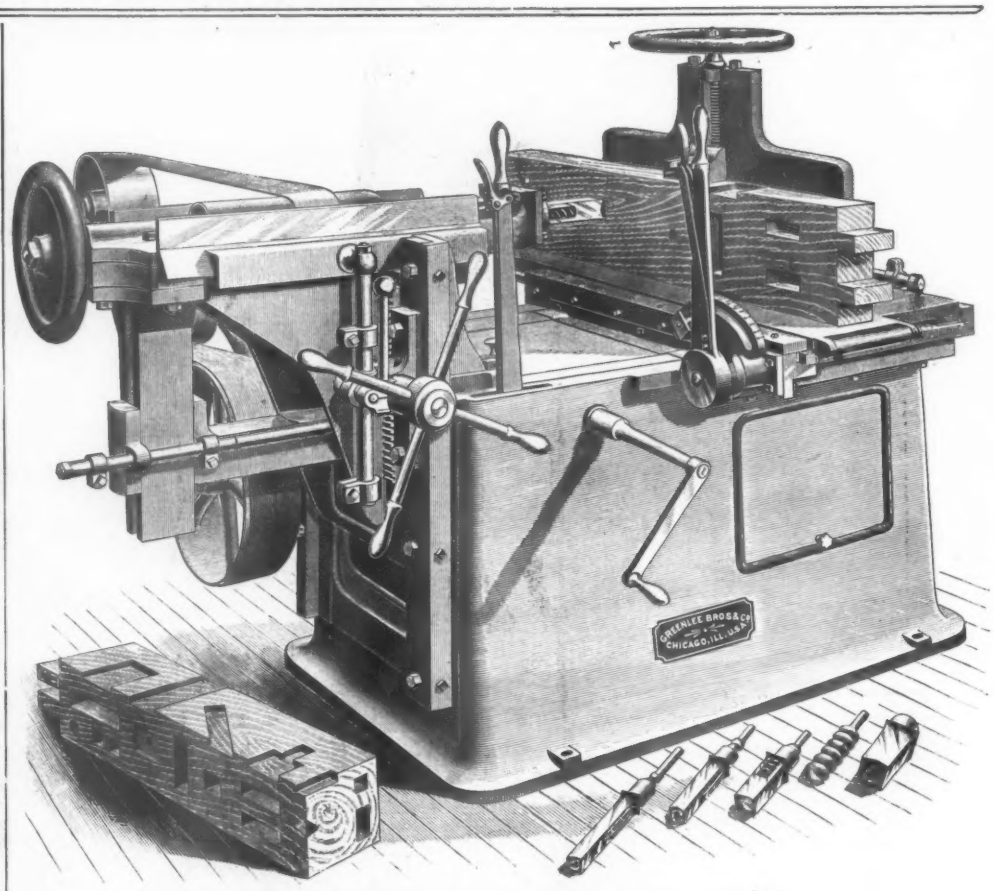
Next to the use of heavier rails Mr. Sandberg considers that the use of the bogie truck is most important for the improvement of railroad practice. He states that it is a satisfactory fact that this system is gaining ground in England. On the Continent, however, it advances very slowly.

Automatic Hollow-chisel Car-mortising Machine.

The machine illustrated herewith is a recent design and has a number of improvements over the hollow chisel mortiser heretofore made by the same house and now largely used by car builders and in railroad shops.

There is no laying out required, as all work can be regulated by stops, and no chips to clean out of mortises, as the machine leaves them clean. The feed is controlled by the upright lever at the side of the machine, and works automatically after being started. The length of stroke can be controlled also by this lever, or, as is generally done, laid out on the horizontal rod in front of the machine. Instead of moving the timber for double mortises or cross-mortising, as with other machines, the carriage with tools is counter-balanced and moved vertically by the hand wheel. The amount of throw is laid out on the vertical rod. The movement of the table to which the timber is clamped can be regulated on the graduated arc, or on the rod back of the table.

In addition to mortising, this machine will also do boxing, gaining and counter-sinking, and can also be used for end-tenoning, thus making it especially desirable for railroad repair shops with a limited amount of machinery. As there is no jar or pounding to the machine, no special foundation is required for it.



AUTOMATIC HOLLOW CHISEL CAR MORTISING MACHINE.

Made by Messrs. Greenlee Brothers & Co., *Chicago, Ill.*

The Rail Trade in 1888.

The most prominent feature in the history of the iron trade during the past year has been the unsatisfactory condition of its greatest single industry, the manufacture of steel rails. Exceptionally prosperous in 1887, the rail makers have been notable sufferers from a decline in 1888. The following table, showing the sales of steel rails, as compiled from month to month from the reports of the members of the association to its Board of Control, best reflects the wide differences there have been between the two years. On the 1st of February, 1887, there had been sold more steel rails for delivery in that year than had been entered for 1888 delivery on the 1st of December, 1888:

ales of Steel Rails.

	Gross tons. 1887.	1888.
To January 1	1,032,850	253,687
" February 1	1,303,140	395,000
" March 1	1,442,891	565,629
" April 1	1,494,384	658,518
" May 1	1,508,048	721,000
" June 1	1,614,545	820,180
" July 1	1,695,055	934,987
" August 1	1,770,449	986,009
" September 1	1,816,444	1,060,000
" October 1	1,833,126	1,113,883
" November 1	1,861,998	1,250,740
" December 1	1,898,444	1,251,177

The reports of sales do not exactly record the time of the transaction, because in many cases business practically concluded but not formally settled by the signature of contracts is not reported until later. Still, the following table may prove of some interest as showing by monthly sales how the activity in the market fluctuated:

Monthly Sales of Rails, gross tons.

Months.	1887.	1888.	1889. Delivery to Dec. 1.
Previous to Jan. 1	1,032,850	253,689	
January	270,290	141,313	
February	139,751	170,629	.....
March	52,493	92,884	.....
April	103,664	62,487	.....
May	16,497	99,180	.....
June	80,510	114,807	.....
July	75,394	51,022	.....
August	45,995	73,691	.....
September	16,682	53,887	40,000
October	28,872	146,857	76,180
November	36,446	437	154,491
Total	1,898,444	1,251,177	270,671

The January report is, of course, not yet at hand, but from even a superficial knowledge of the business reported it may be stated that the sales for 1889 delivery to date are in advance of the aggregate of transactions closed for 1888 delivery at a corresponding period last year. This may or may not indicate heavier buying this year. On the whole, we are inclined to believe that it does.

The following table, showing the shipments of rails from the mills for each month for the years 1887 and 1888 is of considerable interest. The figures cover only heavy rails, light sections not being included in the reports:

Shipments of Steel Rails, Gross Tons.

To	1887.	1888.
Feb. 1	104,226	29,861
March 1	235,160	98,361
April 1	389,532	184,580
May 1	564,403	296,356
June 1	747,181	448,149
July 1	907,351	585,558
Aug. 1	1,045,048	710,502
Sept. 1	1,219,717	824,000
Oct. 1	1,390,825	921,363
Nov. 1	1,569,033	1,029,179
Dec. 1	1,729,108	1,116,788
Jan. 1	1,833,649	.....

Official reports for the production of steel rails by all the mills, and of all weights, showed the total to have been 2,101,904 gross tons, or 268,255 tons more than the association shipments. For the first six months of 1888 Swank's production statistics gave a total of 692,197 gross tons, or 106,639 more than the shipment in the above table. This would indicate a total output of 1888 of between 1,350,000 and 1,400,000 gross tons. The capacity of the country is now between 2,400,000 and 2,500,000 gross tons, including the new mill.—*Iron Age.*

A Freight Yard Crossing.

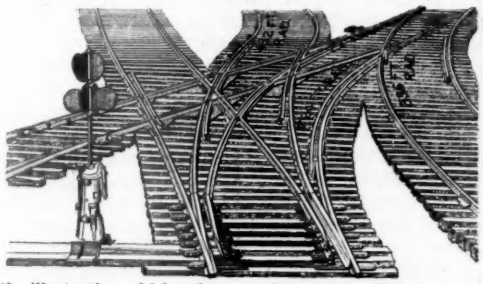
The cut herewith shows a complicated crossing which was put in service a year and a half ago, and has been operated constantly ever since. It is estimated that 540,000 cars have passed over it in that time, and all parts are still in good

DROP-TESTS OF STEEL RAILS AT DOMNARFVET, SWEDEN, 1888

No. of Experiment.	Carbon.	Winter, at −22° F. Deflection in inches; 1-ton ball; supports 3 ft. apart. Fall 7 feet.	Fall 10 feet.	Fall 13 feet.	Fall 16 feet.	Summer, at +90° F. Deflection in inches; 1-ton ball; supports 3 ft. apart. Fall 7 feet.	Fall 10 feet.	Fall 13 feet.	Fall 16 feet.
	Per cent.	Deflec. Inch.	Deflec. Inches.	Deflec. Inches.	Deflec. Inches.	Deflec. Inches.	Deflec. Inches.	Deflec. Inches.	Deflec. Inches.
1	0.25	1 3/16	2 3/4	5 1/16	10	1 1/16	3 3/16	5 11/16	10 1/8
2	0.40	1 5/8	3	5 5/8	broken	1 1/16	3 1/16	5 1/8	9 5/8
3	0.25	1 1/16	3	3 3/16	8 1/16	1 1/16	3 1/16	7 1/16	14 1/2
4	0.30	1 1/16	3 1/16	broken	..	1 1/8	3 1/8	6 11/16	12 1/8
5	0.50	broken	..	..	..	1 1/8	3 1/16	broken	..
6	0.35	broken	..	..	..	1 1/8	3 1/8	5 3/4	11 3/4
7	0.30	1 1/4	1 7/8	4 1/16	7 1/16	1 1/8	3 1/2	6 1/4	14 1/2
8	0.40	1 3/4	3 1/16	5 1/16	10 1/16	1 1/16	3 1/4	5 1/4	8 1/2
9	0.35	1 3/4	1 15/16	4	6 7/8	1 1/4	3 1/16	5 3/8	11 1/4
10	0.35	1 1/2	3 1/16	6 7/16	11 1/2	1 1/16	3 1/16	6 1/16	14 3/8
11	0.30	1 1/2	3 3/8	broken	..	1 1/4	4	7 1/16	15 1/16
12	0.35	1 1/16	2 1/8	4 1/2	broken	1 1/8	2 3/4	4 3/8	7 1/8
13	0.30	1 5/8	3 7/16	6 1/8	12 1/16	1 1/4	3 1/16	6 1/16	12 3/8
14	0.20	1 3/4	3 1/8	7	12 3/4	2	4 1/16	7 1/16	14 11/16
15	0.30	1 11/16	3 7/16	6 3/4	12 3/16	1 1/8	4 1/16	7 1/16	15 1/16
16	0.30	1 7/16	3 1/4	6	broken	1 1/8	4 1/16	7 1/16	11 1/8
17	0.25	1 11/16	3 3/4	6 3/4	13 3/8	1 1/8	4 1/16	7 1/4	14 3/8
18	0.40	1 1/2	3 3/8	5 5/8	broken	1 1/16	3 1/4	5 1/4	10 1/16
19	0.35	1 5/8	3	5 5/8	10 3/4	1 1/8	3 7/8	7 5/16	15 1/8
20	0.30	1 1/8	3 3/16	5 1/16	broken	1 1/8	4 1/16	7 3/8	15 7/8
21	0.35	1 3/16	2 1/8	broken	..	1 1/8	2 3/4	4 5/8	7 1/4

Note.—The bars, 12 feet long, in the summer experiments were tested in a similar way to the corresponding halves in in the winter experiments, with a 1-ton ball, rails supported by cast-iron blocks 3 ft. apart, resting on a 10-ton anvil or base-plate.

condition. This crossing is in the freight yard of L. M. Palmer at Brooklyn. The radii of the curves are shown in



the illustration which is from a photograph. This crossing was put in by the Jersey City Iron Works who are also the makers of the Meeker three-way switch shown.

Brake Report Card.

The brake report, in card form, shown in the accompanying cut, is used on the Southern Pacific. This card is filled out by the conductor and given to the car inspector at the various inspecting points. It gives the date and states the work necessary for repairs. The inspector, after making the repairs, hands the card to the Division Superintendent, who is thus informed of the amount of time consumed in such repairs, and can to some extent remedy or prevent any unusual loss due to excessive time put on the work. This card gives the name of the division, the date and the number of the train on which any defect is found. The left-hand column gives the number of the car and the initial of the road to which it belongs; the right-hand column gives the particulars of the defect. The directions at the top state the method of filling out the card, and also the character of the remarks, in general, to be entered upon the back. This card is signed by the conductor and by the car inspector after the repairs are made. The directions at the bottom of the card state the final destination of the card when it is filled out.

M. 141. (11-11-88-5,000.)

SOUTHERN PACIFIC COMPANY

Division *188*

Defective Automatic Brakes in train .....

Initial and number of car.	Particulars of defect; where discovered; if car cut out, state why; state work done on brake by train-crew, if any. Note-car cuts on back of this card.

Conductor.

To be handed to Car Inspector by Conductor immediately on arrival at Terminal Station. When repairs have been made, this Defect Card to be sent by Foreman of Car Repairs to Div. Supt., stating time train was delayed on above account, and such other facts as should be reported.

(One-half full size.)

TECHNICAL.

Locomotive Building.

The plant and real estate of the Hinkley Locomotive Co. on Albany street, Boston, was offered for sale at auction on Feb. 7, but no bids were offered and the property was withdrawn.

The Lake Erie & Western has received from the Brooks Locomotive Works 10 large Mogul locomotives.

The Louisville & Nashville this week received two additional consolidation engines for the South & North Alabama Division.

The Long Island road has had completed for its use seven locomotives at the Rogers Works, and also a number of switching locomotives at the Schenectady works.

The Mexican road has ordered a number of new Fairlie locomotives and some freight cars from England.

A new locomotive has just been completed at the Olean shops of the Western New York & Pennsylvania. This is the second complete locomotive built at these shops. A local paper notes that it was built "under the personal supervision of Hon. Charles C. Turner, Mayor of Olean and Master Mechanic of the company."

Car Notes.

The Chicago, Milwaukee & St. Paul is in the market for 100 refrigerator cars.

The South Baltimore Car Works has just completed for the Baltimore & Ohio 200 gondola cars. The draw-bar made by the American Continuous Draw-Bar Co., of Aurora, Ind., was applied to these cars. The Superintendent of Motive Power of the road is reported as saying that the company has arranged to use this draw-bar on all new cars which receive extensive repairs.

The Ohio Falls Car Co., of Jeffersonville, Ind., has under construction, for sale, 12 passenger cars, 150 freight cars, 34 ft. long and of 20 tons capacity, and two 32-ft. caboose cars. Six of the passenger cars are finished in antique oak, four with mahogany and veneered panels and two with mahogany and beveled mirrors. Of the freight cars 100 are platform, and the rest are divided equally between gondola, box and stock. The Tennessee Coal & Iron Railroad Co. is now daily receiving coke cars from this company.

The Terre Haute Car & Mfg. Co., of Terre Haute, Ind., is working on an order from the Cleveland, Columbus, Cincinnati & Indianapolis for 200 box cars. The company has also an order to build 75 refrigerator cars for the American Refrigerator & Transit Co. It has just completed 100 stock cars.

Bridge Notes.

The Connecticut River Railroad will build an iron bridge near Hatfield, Mass.

The Hilton Bridge and Construction Co. has been awarded the contract for the superstructure of a lift bridge at North Ferry street, Albany, N. Y. The contract price is $9,375.

A company has been organized at Beaver Falls, Pa., to erect a three-span iron bridge over the Beaver River in that town. The bridge will cost about $40,000, and work will begin in the Spring.

Bills have been introduced in Congress and in the State Legislatures to authorize the Duluth, Red Wing & Southern Railroad to construct a bridge across the Mississippi River at Red Wing, Minn.

A bill has been reported favorably in Congress authorizing the Cleveland, St. Louis & Kansas City Co. to bridge the Missouri River above the city of St. Charles, Mo.

The Verona Bridge Co. has been organized at Verona, Pa., by Henry Berg of that place, and others, to build a bridge over the Allegheny River. The capital stock is $100,000.

The St. Louis Bridge & Iron Co. has been awarded a contract to build a highway bridge over Loutre Creek, Montgomery County, Mo.

The Craig Mineral road will build a bridge over the James River, at Eagle Rock, Va. F. A. Cooper, of Eagle Rock, is Chief Engineer.

The Commissioners of Mendocino County, Cal., will receive proposals for building a bridge with a span of 250 ft. across Big River.

New iron bridges are being built by the Western New York & Pennsylvania at Portville, N. Y., Larrabee's, Pa., and Oil City, Pa., the one at the latter place being nearly finished. A fourth will be built at Petroleum Centre.

The Southern Bridge & Railway Co., with a capital stock of $1,000,000, has been chartered to build a bridge across the Mississippi river near New Orleans. The incorporators are E. L. Corthell, A. Baldwin, Charles Smith and others.

Manufacturing and Business.

The Lehigh Valley is putting the American Steam Driver brake on a large number of its freight engines.

The Metzgar Roofing Co., of Beaver Falls, Pa., has a contract from Carnegie, Phipps & Co., for 500 squares of steel roofing, to be used on the wire nail works in Beaver Falls.

The Iron Car Co., has removed its office from 115 Broadway to 120 Broadway, New York. Mr. G. W. Ettenger is now General Manager of the company.

The Philadelphia & Reading has let a contract to the Edison Co. for lighting with electric lights the ferryboats running between Philadelphia and Camden, N. J.

The following two companies have been incorporated in Illinois: The Inter-state Rolling Stock & Construction Co., of Chicago, with a capital stock of $500,000, by W. S. Brewster and others, to construct and operate railroad cars. The Hollenback Frog & Switch Co., of Chicago, with a capital stock of $250,000, by T. H. Brown, W. Hollenback and W. B. Mills.

The Union Switch & Signal Co. has declared a six per cent. dividend on the $500,000 of preferred capital stock.

Gould & Eberhardt, of Newark, N. J., report a recent shipment of their patent Eberhardt's automatic gear cutter and drill presses to Koping, Sweden, and also to Kharkoff, Russia.

On one of the Thomson-Houston motors in use on the electric railroad at Wichita, Kan., a copper brush was in continuous use for 65 days, during which time the car covered a distance of 4,300 miles. This is said to be the longest time that a motor brush has been in continuous use.

The Westinghouse Air Brake Co. has placed with Manning, Maxwell & Moore, of New York, an order for 214 21-in. lathes, for the new shops now being constructed. This is probably the largest order ever placed in this country for this class of machine tools.

Iron and Steel.

The new Bessemer addition to the Crescent Steel Works of Miller, Metcalf & Parkin, at Pittsburg, is nearly finished, and it is expected that it will be placed in operation this month. The hydraulic cranes, engines and converters are all in place.

The plant of the Allegheny Bessemer Steel Co., at Duquesne, Pa., is now completed, and everything is ready for starting operations in the converting department. The buildings are entirely of iron. The converting and blooming mills are in one building, which is 75 × 200 ft. in area. The rail mill is 68 ft. wide and 380 ft. in length. The building covering the hot-beds is 80 ft. wide by 200 ft. in length, while the wing inclosing the finishing machinery is 48 × 64 ft. There are two Bessemer converters with a capacity of 7 tons each. To supply the steam for the rail mill there are 20 boilers, 44 in. in diameter and 24 ft. long, and for the converting department 16 boilers, with similar dimensions. These were all furnished by James McNeill & Bro., of Pittsburgh.

Williamson Furnace, of the Williamson Iron Co., at Birmingham, Ala., has been repaired and Massick & Crook hot-blast fire-brick stoves, for which McClure & Schuler, of Pittsburgh, are the agents, have been introduced, and the furnace has been partially relined. The capacity of the furnace will now be increased from 60 to 75 tons per day.

The Edgar Thomson Steel Works propose to erect a small foundry especially adapted to making ingot molds.

The Midvale Steel Co., of Philadelphia, has been awarded the contract for furnishing the tires to be used on the New York Central & Hudson River and the West Shore roads during the year 1889.

It is expected that the large new plate mill now in course of erection by the Maumee Rolling Mill Co., of Toledo, O., will be ready to commence operations in March.

At the annual meeting of the stockholders of the Cambria Iron Co., of Johnstown, Pa., held in Philadelphia last week, the following officers were elected: E. Y. Townsend, President; Powell Stackhouse, Vice-President; William S. Robinson, Secretary and Treasurer, formerly Secretary and succeeding John T. Killé as Treasurer.

The Bethlehem Iron Works, at Bethlehem, Pa., will soon make its first delivery of steel forgings for large guns, under its contract with the Navy Department. The company has erected a new plant at an expense of $1,000,000, and will soon be able to supply forgings for 6, 8, 10 and 12 inch guns. The four 6-inch guns for the gunboat Petrel are now being finished at the foundry, and will be ready for shipment when that vessel is completed. The two 8-inch guns for the cruiser Charleston will soon be commenced.

The National Forge & Iron Co., of 557 State street, Chicago, has been organized, with a capital stock of $250,000, to build a rolling mill in the vicinity of Chicago. Marks Swarts is President of the company, Seymour Swarts is Secretary, and W. J. Quarley will also be associated with the company. It is expected to have the mill in operation within six months. The machinery will comprise two trains of rolls, one 10 in. and one 18 in., operated by one 500 and one 250 h. p. engine; a lever shear, with engine, to cut 5 in. rounds cold; five other shears to cut small iron, scrap, etc.; two large steam hammers; one rotary squeezer, weight 95,000 lbs., to take a 250 to 275 lb. ball; six busheling furnaces, three double heating furnaces, one extra shingling furnace and three heating furnaces for the forge. The works will make a specialty of iron for railroad cars, car axles, etc

New Shops.

Proposals will be received at Philadelphia by W. H. Brown, Chief Engineer of the Pennsylvania, until Feb. 28, for erecting at Altoona, Pa., the proposed machine, erecting, boiler and smith shops.

The contract for the erection of the Bradford (Pa.) car shops of the Buffalo, Rochester & Pittsburgh has been awarded to John Walter, of Ellicottville, N. Y. Work will commence as soon as possible. The building will be 40 × 160 ft.

The Louisville & Nashville car shops, under construction at New Decatur, Ala., will be ready for the machinery in the next 10 days, and within 60 days from the commencement of fitting the machinery the plant will begin operations.

The Alabama Great Southern has commenced building the engine erecting shops at Birmingham in connection with the car shops. The erecting shops will be situated between the car shops and the machine shops. The contract for construction has been awarded to Adams & Schneider, and they are to be completed within 90 days.

Car Heating Notes.

The Pennsylvania Co. is fitting up a train of five cars to be heated by a system of water circulation. The water is heated by a coil placed in a dome on the top of the boiler. The system is the device of Mr. R. J. Wilson.

The Bicycle Locomotive.

The bicycle locomotive built by the Portland Co., Portland, Me., for the Boynton Bicycle Railway Co., has been fired up and run back and forth on a track 200 ft. in length. It is stated that the engine was so evenly balanced on its wheels that the wheels adjusted to the guide rail overhead were much of the time entirely free, touching neither side of the guide-rail. The locomotive has one driving wheel 8 ft. in diameter and two 4-ft. wheels under the end of the frame which carries the fuel, the general arrangement being somewhat similar to a Forney engine. Its weight is about 22 tons.

The Nicaragua Canal.

The passage by Congress last week of the bill incorporating the Maritime Canal Co. of Nicaragua has brought to us a fresh crop of letters asking for the address and the names of the officers of the company. The office of the Nicaragua Canal Construction Co. is 36 Wall street, New York City. The President is A. C. Cheney; First Vice-President, Francis A. Stout; Second Vice-President and General Manager, H. C. Taylor; Secretary, J. W. Miller; Chief Engineer, A. G. Menocal, and Sub-Chief Engineer, R. E. Peary. There seems to be a very good prospect that the capital for the construction of the canal will be raised, and it is quite likely that the work of construction will soon begin.

THE SCRAP HEAP.

Notes.

The Chicago, Burlington & Quincy has lengthened the run of its freight crews between Chicago and Galesburg, so that they now run through between those points.

A severe snowstorm blocked the roads in northern New York and Canada on Thursday and Friday last.

The Canadian Pacific has completed an elevator at Fort William, on the north shore of Lake Superior, which has a capacity of 1,400,000 bushels.

Railroad Commissioner Peterson, of Wisconsin, in his biennial report asks for a more specific law that his opinions may be placed beyond dispute. Attention is called to the necessity of legislation to compel sleeping-car companies to pay a larger license fee on their gross earnings, whether made on business wholly within the state or not.

The agreement between the Presidents of the Western roads for the organization of the Inter-State Commerce Railway Association still lacks the signature of five or six important roads. A meeting is called for Feb. 19 at Chicago.

New Station at Pueblo.

At a meeting of the presidents and general managers of the lines entering Pueblo, Col., last week, plans were adopted for a new union station, to cost between $200,000 and $300,000. The companies interested are the Denver, Texas & Fort Worth, Denver & Rio Grande, Chicago, Kansas & Nebraska, Missouri Pacific, and the Atchison Topeka & Santa Fe.

Curtailing Sunday Work.

A Philadelphia dispatch of Feb. 12 says: "The Pennsylvania Railroad has ordered that all freight trains east of Pittsburgh and Erie, except such as carry perishable freight live stock and high class freight, shall stop at 10 o'clock on Saturday evenings and that the crews shall not return to work until the following Sunday at 7 o'clock p. m. We hear that the same order, slightly modified, has been issued on the Pittsburgh, Cincinnati & St. Louis. "High class freight" includes probably nearly everything except coal, iron, lumber and similar coarse bulk freight, so that the actual diminution in the number of trains may not be so great as appears.

An Inspector on the Wabash.

The Wabash road has created an office similar to that on the Savannah, Florida & Western, which was described in the *Railroad Gazette* of Dec. 7 last, as will be seen by the following circular:

To Employés in Station and Train Service, Wabash Railway:

The office of Inspector of Station and Train Service is hereby created. The duties of this official, who is not clothed with authority in matters of discipline, are to go among the agents, operators and trainmen on the road, questioning each man or crew as to how they understand the rules, and observing how they are carried out; to answer all questions propounded regarding the proper construction of each rule, and in every way to aid the men to become more efficient employés, and the management to render the public first-class service.

It should be understood by all employés in the Transportation Department that this official shall be respected in the same manner as the Train Master or any other officer, and that he is only expected to report violations of the rules to the same extent as every other employé is required to do, and by proper warnings keep the men out of trouble if possible.

Mr. C. W. Hazeltine is appointed to this position and will report to the undersigned.

G. W. STEVENS,
Assistant General Superintendent.

Funeral Cars.

The Brill Car Works, of Philadelphia, have just finished three street cars, designed to transport the dead in Buenos Ayres. They are first, second and third class, the first being designed to carry the body of a wealthy individual, the last the corpse of a pauper. The first-class car is very handsome. The body is a rich black toned with purple, with passion flowers painted on the sides. The windows are of French plate glass. The seats, folding up against the sides, are upholstered in black plush, and the window curtains are of black cloth trimmed with gold bullion. In the forward end of the car is an altar, with silver cross and candelabra, while on either side the altar are stained glass windows. The interior of the car is finished in white and gold. The metal work is nickel-plated and handsome in design. On the top nine large sable plumes are placed. The other cars are much simpler and plainer in design, and the third-class car has merely a row of shelves for the coffins. These cars are intended to run on the street-car tracks in Buenos Ayres. It is said that similar cars are used in the City of Mexico and in some cities of Central America.—*Philadelphia Times.*

RAILROAD GAZETTE

Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The abstract of Mr. Sandberg's paper, urging the importance of heavier rails, which is printed on another page, contains little in which American engineers will differ from him, unless it be his conclusion that a rail is less fit to resist blows in cold than in warm weather. It is well known that Mr. Sandberg has long held this view. Twenty years ago he made a series of experiments, the results of which were published in his translation of the work of Knut Styffe, which went to show that rail iron had only from one-fourth to one-third the strength to resist sudden shocks at 10° F. that the same iron possessed at 84° F. Nevertheless, his conclusions have not been generally accepted. The tests made by him last year on steel rails, and recorded in the table now printed, give similar results for steel. The number of blows required to break each specimen is not stated. Out of 21 specimens 10 broke at — 22° F. and only one at + 90° F. None with less than 0.30 per cent. carbon were broken in either test, and the one broken at the higher temperature was the only one having 0.50 carbon. It will be seen, however, that the breakages did not by any means increase with the proportion of carbon. Out of seven specimens with 0.30 per cent. carbon four broke; of six with 0.35 per cent. carbon, three broke, and of three with 0.40 per cent., one broke. The specimens with high carbon in several instances endured severer tests than those with less. The table, therefore, can be accepted only as tending strongly to support Mr. Sandberg's theory that steel is more brittle at a low temperature than at a high one.

In another column will be found a short account of some brake tests made at Chillicothe, on the Chicago, Santa Fe & California. If railroad companies need any further argument than they have had in the past, to convince them that it is necessary to pay strict attention to the character of the couplings between freight cars and to the inspection of the brake attachments while being applied by the car builders and while in operation, they will find such argument in the reported results of the above mentioned tests. These cars were fitted with the Potter draw-bar in most cases. A few, however, had some of the automatic vertical plane couplers. The amount of the slack in this train was so great that the uneven application of the brakes, resulting from the length of the train, and from the presence of two kinds of triple valves in the same train, gave rise to shocks which, as stated by those present, would have demolished old cars, if there had been any in the train, and if continued would have severely injured the new ones. While in this case the presence of the two kinds of triple valves resulted in increasing the amount of the shocks, yet if there had been little or no slack in the train, which would have been the case if the cars had been fitted with automatic vertical plane couplers, the shocks which would have resulted from the presence of the two kinds of triples would have been too small to have been considered dangerous, as has been conclusively proved. Here is a case where 60 cars were selected at random, and only 45 were found to be ready for use, for which condition not an atom of responsibility rests with the brake devices themselves, or with the tightness of the joints of the piping. It is stated that there were very few leaks in the train, and that in that respect the brake equipment was quite equal to that of passenger trains, but owing to neglect on the part of the builders of the new cars used in the tests the piping had not been carefully blown out before putting on the triple valves, and therefore the valves were immediately filled with sand and fragments of iron rust which will always be found in piping when new. The power brakes, when applied to trains of 50 or 60 cars, represent a great saving of time, labor and expense to any railroad company, and it is against reason to expect that any such advantage is to be obtained without some outlay of both time and attention to details which secure this advantage. The Santa Fe is now devoting considerable energy to the perfection of the details of the power brake and car coupler equipment of its freight cars, and is operating some of the longest freight trains in the country. It has found that close attention to those accessories which permit economical hauling of many cars in one train results in direct savings which more than compensate for the outlay of time and money, to say nothing of the feeling of increased security.

A communication in another column calls attention to what might be an interesting feature in locomotives and vehicles *without* springs and equalizers; we cannot, however, see how the argument applies to locomotives in use either in this country or in England. The inertia of the body of a locomotive is wholly neglected, as well as the extension of the springs above the front and rear wheels. When locomotive driving wheels pass over obstructions on the rails the wheels will rise from the track. If the locomotive drivers are equalized together, with arms of equal lengths, then the body of the locomotive will be raised about half the height of the obstruction, provided that the locomotive is moving at a very slow speed. At a speed of four or five miles per hour or more, the fraction of a second during which the locomotive is passing over an obstacle is so small that the inertia of the locomotive resists any additional upward pressure of the springs. We know of cases recently where the driving wheels have risen from the track, by reason of improper balancing, 2½ in. without raising the locomotive at all, This was proved by the fact that the driving wheel cut out the wheel guards, while if the locomotive had risen the wheel guards would have been uninjured. Again, if the locomotive did rise from the track slightly the tension on the forward and rear truck springs would still keep some weight upon the forward and rear trucks. The passage of a locomotive driving wheel over an obstacle is so instantaneous that it is doubtful if the weight on the rails at the front and rear would be materially changed in that time. If the wheels were rigidly attached to the frames, undoubtedly there would be a chance of derailment while passing over obstructions on the track. We do not know that American locomotive designers make it a point to obtain an equal pressure of the driving wheels on the rails for the sake of preventing derailment, as stated by our correspondent. The sole and only purpose, as we understand it, is to reduce, by a uniform distribution of weight, the concentration at any individual point.

We fear that our correspondent does not comprehend the demands of travel in the eastern portions of the United States, because it has been found necessary to adopt locomotives weighing 70,000 lbs., upon the drivers, in that section in order to haul the express trains, and surely this weight cannot be expected to be placed on two driving wheels. Undoubtedly the addition of a sand blast and rail cleaning device, as used in England, in the front and rear of the driving wheels of American locomotives would increase their hauling capacity, but not to any such extent as would be necessary in order to enable the lighter locomotives to do the work demanded of heavier ones now in use, and thus allow the substitution of lighter types of engines. The steaming power of the two-wheel express engine would have to be the same as that of the four-wheel or six-wheel express engine if it performed the same work, therefore the total weight of boiler and attachments would be approximately the same. It is doubtful if the decrease in first cost by the substitution of trucks, instead of additional driving wheels and parallel rods, would compensate for the additional trouble of the maintenance of a proper sand blast and steam cleaning devices. Express locomotives with a single pair of drivers have been tried in this country, and, so far, without success, there being on the contrary a tendency in favor of more than four drivers on locomotives for use on heavy through express trains.

The continued use of Belpaire fire-boxes indicates a growing sentiment in their favor. We illustrate in this issue a boiler fitted with that type of fire-box used on the Lehigh Valley. This boiler has given excellent service, and an inspection of the cut shows how readily such a boiler is kept free from scale, and how little obstruction there is to ebullition from the crown sheet. This is true of all boilers with Belpaire fire-boxes. It was anticipated, when these fire-boxes were first introduced in America, that a difficulty would be encountered in the breaking of the stay bolts. Such, however, has not been the case, and so far, the experience of the railroads, using this design of fire-box, is that they are more serviceable, easier cared for and stronger, besides being cheaper in the first cost, when of equal capacity, than the common design with heavy crown bars. This type of boiler is lighter and has better steam spaces, and, taken as a whole, seems to be a step in advance in locomotive boiler construction. American railroads have been slow in taking this step, why, we know not, but the fact remains that boilers of this type have been in use in America for over twenty years, and even now there is no general adoption of it. The Central Pacific, the Pennsylvania, the Lehigh Valley, the Chicago, Burlington & Quincy, and some other American roads, have used this design extensively. The New York elevated roads have had considerable experience with it. From all sources we hear only the best reports from its practical use. The Belpaire type of boiler is particularly advantageous in the case of switching locomotives where the additional weight of the crown bars renders difficult the proper distribution of the weight of the locomotive upon the driving wheels. It is also advantageous in the Forney type of locomotive, wherein it is difficult to remove the weight from the truck to the drivers without a complication of equalizing levers. Its greatest value lies in the possibility, which it promises, of using higher pressures without a material increase in thickness of sheets. For instance, in designing a 60-in. wagon-top boiler, of the usual rise of wagon-top, to carry 200 lbs. pressure, it will be found by calculation that the sheets in the outer shells of the fire-box will have to be about ⅜ in. thick, whereas, with the Belpaire fire-box design, the sheets in the outer shell of the fire-box need not be thicker than in the waist of the boiler, even when the boiler has a considerable rise at the fire-box end; and, further, it is not necessary that the outside sheets of the fire-box should be much thicker than those of inside of the fire-box, because both the inner and outer sheets have about the same staying and are called upon to resist nearly the same strains. The introduction of the compound locomotive, the general demand for higher pressures, the continually increasing weight of trains, and the increasing amounts of steam demanded for heating, electric lighting and various other uses, while trains are in motion, all tend to require an increase of power in locomotive boilers. This will increase the field of usefulness of this type of boiler in the locomotive of the future.

The recent cold weather has called renewed attention to the dissatisfaction expressed by some New York shippers of perishable fruit and other goods, as to the arrangements made for transportation westward. It has been for years the custom to carry these goods in refrigerator cars going back empty. Experience has shown that the refrigerator cars prove in all ordinary cases a sufficient safeguard against freezing, because of more careful construction and air-tight compartments and doors. The habit of the railroads has been to give the use of these cars free of extra charge to their patrons, reserving to themselves the right to reject all shipments so consigned and to erase the words "Refrigerator car" from the receipt. In short, not to guarantee such cars. It is here that the complaint of the shippers comes in. They declare, first, that they cannot easily learn from a railroad station whether a refrigerator car will be furnished in a particular case or not, and, second, that goods shipped in such cars sometimes arrive at destination in common cars, and when in such cases usually frozen and worthless. And the blame and loss invariably fall upon the shipper, whose orders are to ship in refrigerators. As to the last complaint, of course, reputable lines would not transfer perishable freight to common cars without some very good reason, such as the breaking down of the car; and another refrigerator car may not then be near. This

does not, however, relieve the shipper's obligation to his customer; but as nothing has been paid for the use of any special car, severe criticism is misplaced. The first point, that cars are not furnished, as well as the last point, resolve themselves into this, that railroads are not willing to bind themselves at extra expense to furnish extra facilities free of cost. Nevertheless, the present plan is a great inconvenience to merchants who wish to ship goods which may be injured by freezing, and such a commercial demand ought to be met by some plan. If necessary to charge one class higher for shipments guaranteed to be carried in refrigerator cars, let it be done. If necessary for the prompt dispatch of business, let some day or days each week be set apart for receiving perishable goods for such cars. This is done on certain Western roads, and we understand works very satisfactorily. The present system or no-system pleases nobody, and is a disappointment and often a loss to the shipper. The railroad, as things generally go, feels no great enthusiasm in a branch of traffic which disarranges the orderly dispatch of business without compensation. But the public would no doubt gladly pay a reasonable extra charge for the added accommodation, and it should be given.

The controversy now going on west of Chicago about live stock rates illustrates the necessity of being first in the field if one wishes to succeed in affairs in which custom has such a potent influence, and should give a point to the roads interested in the refrigerator traffic just mentioned. The western roads after carrying live stock for years by the car load without weighing, while at the same time often cutting rates so that the price by actual weight was excessively low, concluded to try the more accurate and sensible plan of charging by actual weight. But no sooner is the plan inaugurated, after laborious clearing away of obstacles, than the shippers and consignees bring forward all sorts of complaints. They say the time occupied in weighing the cars is so great that the delay involves a whole day's loss on some of the stock; that the cattle are injured by the weighing, and so on; and the Kansas Railroad commissioners have given a decision that the old sytem must be restored. But no doubt the real animus of the shippers' indignation, or at least the main substance of it, is based upon the increase in price. The rates have been so much of the time at a low figure, while the weight per car has been kept up, and even increased, that a reasonable rate per 100 lbs. is at once found to be very much higher than the old price; while a rate per 100 lbs., which will make the total bill on a car load aggregate the same as before is generally so low as to almost scare the railroads, though the surprise is of their own making. The fact that charging by weight is the fairest method for billing car loads of live stock, as between different shippers and between competing railroads, apparently will cut but a small figure in the argument, and the roads are in danger of having to continue a bad practice simply because it has got entrenched in custom. Likewise in refrigerator car traffic; if the roads do not inaugurate a proper and satisfactory system, with reasonable rates, the force of events will introduce one which they will have to submit to whether they like it or not. Some road will, some day when striving to work up traffic where traffic is scarce, give shippers what they want without any additional charge whatever, and then competitors will have to follow the example; and it is to be remembered that it is easier to forestall competition than to set limits to it.

The consolidation of interest, whether partial or complete, between the Cincinnati, Indianapolis, St. Louis & Chicago and the C., C., C. & I. ought to result in some convenience to both of these systems, and be of corresponding benefit to districts immediately served. Otherwise, we attach no great significance to what has happened. The general direction of the two roads is at right angles to one another. It is hard to see how any great diversion of through traffic from its old routes can result from their combination. The business of this district is done on such a narrow margin of profit that there is no great object in attempting to divert traffic by a route which has a long or very marked elbow. The working of the Inter-state Commerce law has had no effect in increasing the incentives to handle such business. If anything, it rather diminishes them. It is, of course, possible that if the "Big Four" had fallen into unfriendly hands, it might have served to divert traffic from the Northern routes to the more Southern ones; but the loss from this contingency would have been slight. We suppose that some people will quote the proposed transaction as showing the tendency to ncrease consolidation under the present law. We see no reason for such an explanation. The facts of business make consolidation result in economy almost anywhere, even if the roads are at right angles to each other. We believe that this ordinary administrative economy is at once the chief reason for the change, and the chief result to be expected from it.

The Compound or Double-Expansion Locomotive in American Service.

I.

In what follows the purposes and usefulness of compound locomotives will be considered under three divisions:

(a) The defects in the common locomotive which the compound or double-expansion locomotive is expected to remedy or remove.

(b) The general features of construction and operation of the double expansion locomotive.

(c) The possibility of the extended use of double-expansion locomotives in America.

(a) There are three principal defects in the common single expansion locomotive engine which operate directly against its economy and hauling capacity. These are: First, excessive cylinder condensation; second, insufficient power in starting trains; third, a lack of power when moving trains at high velocities.

Cylinder condensation may, in general, be defined as the amount of steam passing through the cylinder and giving out little or no useful work. The amount of cylinder condensation in any particular engine is difficult to determine. In some types of the stationary engine it has been found, by experiment, that cylinder condensation amounts to as much as 75 per cent. of all the steam entering the cylinder. In the better class of engines, under more favorable conditions, this condensation is as low as 20 and 25 per cent. Rarely it is found to be only 17 or 18 per cent. of all the steam used. The amount of cylinder condensation in locomotive cylinders, in actual use, has never been determined by accurate experiment. The reason that it has not been done is that it is a very difficult experiment to accomplish. Accuracy in this respect would require cumbrous calorimeters to be carried upon the locomotives, and a completeness of apparatus almost impossible to obtain on a moving structure of this character. There is a class of calorimeter which might be used to some advantage and, although not wholly satisfactory, yet it furnishes an indication of the amount and character of the steam entering the cylinders. This class of calorimeter has been in use only a short time. Probably we shall soon know of its being used in locomotive experiments.

The conditions under which locomotives operate, exposed as they are to the rigors of climate, and being but slightly protected against the radiation of heat, are such as to make the cylinder condensation very great. The loss of steam resulting from condensation depends upon the temperature of the walls of the cylinder against which, and in the vicinity of which, the entering steam is compelled to pass. The cooling of the walls of the cylinder is brought about in two ways. First, by the conduction of heat to the surrounding air, and, second, by contact with the exhaust steam during the period of exhaust. The reduction of temperature caused by conduction of heat to the air surrounding the walls of the cylinder can be, to a great extent, prevented by paying strict attention to the heat insulation of all parts of the cylinder body, and particularly the cylinder heads. The cooling of the walls of the cylinder by contact with the exhaust can only be remedied by reducing the difference in temperature of the exhaust and the entering steam; this is the function of the double expansion engine.

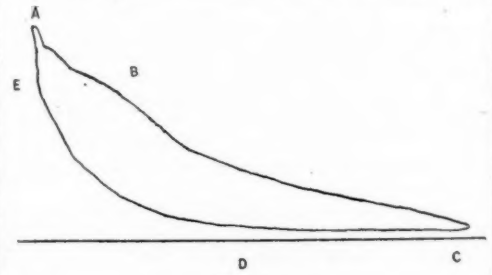


Fig. 1.

When starting trains, the common locomotive with a single cylinder has not sufficient power to utilize all the tractive force on the draw bar which the weight of the locomotive, available for adhesion, would allow. To obtain all the power possible in such cases, the Stephenson link motion is so altered as to place it in its worst form for economical use at high speeds. This alteration, for the purpose of increasing the power at starting, is accomplished principally by cutting off the outside lap of the slide valve, thus increasing the maximum cut-off. The reduction of the outside lap of the valve has the effect of decreasing the amount of the port opening at any of the shorter cut-offs, and, therefore, increasing the wire-drawing and inefficiency of the locomotive at high speeds. This can be seen by the change in the shape of the live steam side of the indicator card taken from such engines, see fig. 1. It also has the effect of altering the point of the exhaust closure in such a manner as to increase the amount of compression and back pressure, thus reducing the area of the indicator card by cutting it off on the exhaust and compression sides. These two evils are the direct result of cutting off the valve on the outside in order to obtain power when starting trains.

When a single expansion locomotive is traveling at high speeds the great obstacle which resists further increase of speed is the back pressure and compression in the cylinders. This back pressure and compression is caused by an improper action of the valves and by the large amount of low pressure steam which must pass through the exhaust nozzles. Undoubtedly a variable exhaust would, in many cases, assist in reducing the back pressure, but such a variable exhaust which is satisfactory and which can be adjusted to suit the varying speeds has not yet been produced. If a suitable variable exhaust were obtained it would require too much intelligence to operate for average service, if the possible advantage to be derived therefrom were to be realized.

Fig. 1 shows an indicator card taken at recent experimental tests at a speed of 45 miles per hour. An observer, watching the action of this locomotive, could see that it was at about the limit of its hauling capacity, and could generate no more power at that speed. Gradually the cylinder power, per stroke, had been decreasing as the speed increased from five miles per hour. The reversing lever had been drawn up toward the centre, thus shortening the cut-off, and the wire drawing had been increasing on the steam admission side of the card. This is shown by the difference between the corresponding portions of the two cards, fig. 1 and fig. 2, at *A B*, both taken from

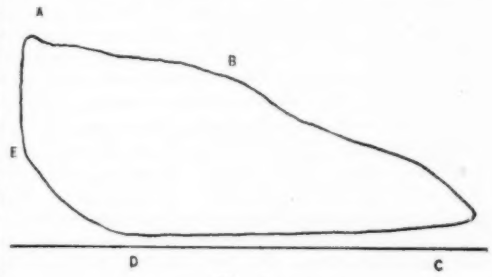


Fig. 2.

the same locomotive at speeds of 45 and 24 miles per hour respectively. It is seen that the steam was very much wire-drawn in fig. 1. The back pressure had not decreased, at the higher speed, as seen by the difference between the lines *C D*, figs. 1 and 2. The point of exhaust closure had been changed from *D*, fig. 2, to *D*, fig. 1, thus still further reducing the card as shown by the compression lines *D E*, figs. 1 and 2. The foregoing modifying actions combined to reduce the card from 40,640 foot-pounds per stroke in fig. 2 to 17,272 foot-pounds per stroke in fig. 1. The most unfortunate feature of this condition of steam use is that such reduction, as above shown, could not be avoided by the engineer in charge of the locomotive. He was following the line of least resistance, and did all possible to maintain the power of the locomotive at a maximum. The cause of this reduction lies wholly in the limited range of the Stephenson link motion. This motion, when designed for slow speeds, is quite unfit for high speeds as shown above.

In order to improve the hauling capacity of the common locomotive at high speeds a larger proportion of the adhesion of its drivers must be utilized at such speeds. To accomplish this the cylinder power at high velocities must be increased. At first sight it might seem as if this were an easy matter, but difficulties arise at the start, as follows:

An increase of steam pressure results in a greater weight of steam being admitted into the cylinder per stroke, and consequently a greater volume at the terminal pressure. This greater volume increases the back pressure.

Increasing the length of the cut-off increases the amount of steam entering the cylinder per stroke, and thereby increases the back pressure.

Increasing the diameter of the cylinder increases its volume, and because no less cut-off than that used

with the smaller cylinder will suffice, if greater work is to be done per stroke, a larger volume of steam will also be used at each stroke, resulting again in an increase of back pressure. This change is, however, for other reasons, the most advantageous of the three changes here mentioned, and will, to a limited extent, produce the desired result.

One of the difficulties resulting from an increase of cylinder power or cylinder diameter, is the increased liability of slipping the drivers at low speeds, and while starting trains. This is true whether the engine be a double or a single expansion engine, and results simply from an increase of cylinder power. It has been stated that an increase of the diameter of the cylinder of an ordinary locomotive would produce the desirable results expected from the compound engine. While this may be true with respect to the increase of power, it is not true that the engine will have the same economy, because the compound engine has the advantage of decreasing the cylinder condensation and increasing the ratio of expansion at low speeds in a much greater degree than could be obtained from a single expansion engine with any permissible increase of cylinder capacity.

(b) The compound engine was originally an engine which had two cylinders, one of which was used in connection with a condenser, and the name is more properly applied to those engines which have a high pressure cylinder and a low pressure cylinder connected with a condenser. The double and triple cylinder locomotives used in England and the quadruple cylinder locomotives being experimented with in France, are, properly speaking, "double expansion" locomotives, and not compound locomotives. Thus the Webb double expansion locomotive with its three cylinders is a triple cylinder locomotive, arranged for double expansion. Some of the other types, having two cylinders, one high and one low pressure, are double expansion engines, the same as the Webb locomotive with its three cylinders, and may be called double expansion locomotives, having double cylinders, to distinguish them from those having triple and quadruple cylinders.

The construction of the double expansion engine differs necessarily from the ordinary single expansion locomotive only in a few details. Its valve motion must be such as to admit steam into the high pressure cylinder, and from that into the low pressure, and be also arranged so as to admit high pressure steam into both when necessary. These cylinders are sometimes made inside and at other times outside connected.

In order to adapt the American locomotives to use double expansion, a slight change in the cylinders, cranks and valve motion would alone be necessary. The wheels, frames, fire-box, boilers and leading trucks could remain as they are now constructed. As an example of this alteration we refer our readers to the late design of the Worsdell and Von Borries type of engine, which, as adapted to American designs, to such an extent as to permit the use even of the same valve gear, was illustrated in the *Railroad Gazette*, Dec. 14, 1888.

For American use it will probably be necessary, in order to satisfactorily start the trains, that the arrangement of valves be made in such a way that high pressure steam can be admitted to the large cylinder when necessary; this has been found to be a necessity in England, but at first was not so considered. It will be well, also, to have the cut-offs in high and low pressure cylinders regulated independently, and it may be better to have both pairs of drivers connected together in order to prevent tire slipping, and to render the whole adhesive weight effective for starting trains. When the drivers are disconnected, an excess of power in one cylinder would cause the pair of drivers connected thereto to slip and thus reduce their adhesion; and, further, the regulation is very difficult if both pairs, when separately connected, are to be kept from slipping by the engineer operating different handles.

There are two general classes of double expansion locomotives in use in England. One is that designed by Worsdell and Von Borries, in use on the Northeastern. This type has two cylinders, one 18 in. in diameter and the other about 26 in. These cylinders are connected to the same axle. Provision is made in this engine for the admission of high pressure steam to the low pressure cylinder to assist in starting trains. This design has been adapted to the American type of locomotive, as before mentioned.

The other class is that designed by Mr. Webb, and used upon the London & Northwestern. This type has three cylinders, two high pressure, 14 in. diameter, connected to the rear driving wheels, and one low pressure cylinder, 30 in. diameter, connected to the main driving wheels. No provision was at first made in this class of engine for the admission of higher pressure steam to the low pressure cylinder, but this has since been found to be necessary.

On account of the large diameter of the second cylinder in this type a pressure regulator is used to reduce the high pressure steam about one-half for use in the low pressure cylinder. This is the type of engine which has been purchased by the Pennsylvania Railroad.

On page 815 of the *Railroad Gazette*, Dec. 14, 1888, will be found a description of the Worsdell and Von Borries system of compounding locomotives adapted to American designs. In the *Railroad Gazette*, Aug. 21, 1885, will be found a description of the Webb system of compounding used on the London & Northwestern. Indicator cards from the Webb compound will be found in the *Railroad Gazette*, Aug. 12, 1887.

The Bearing of German Tariffs on the Car-load Cases.

There has been so much allusion to the German practice in the arguments on the car-load rate cases that it is worth while to give some account of what that practice really is.

The German tariff is avowedly based on the principle of equal mileage rates. The terminal charge is so low as to cause hardly any variation from this standard. The first classification of goods is into express parcels and car loads. The latter include about 90 per cent. of the whole traffic, while the parcels hardly amount to five per cent.

The parcels rate is at least nominally independent of the value of the goods. There are certain classes of goods which take double, or one and a half times parcels rates, as the case may be; but these are mostly goods whose bulk or loose condition requires the use of an unusual amount of space. On the other hand, empty boxes, kegs or cans which have been in actual use and are not shipped as merchandise are charged only half parcels rates. There are a few other goods of minor importance which have a special classification under the parcels rate; but all this traffic amounts to very little.

On the other hand, the car-load classification, which covers a far greater volume of traffic, is largely based on value. There is a general half car-load class with a minimum of 11,000 lbs. a general car-load class with a minimum of 22,000 lbs. a special tariff for half car-loads in goods of lower value, and three special car-load tariffs for whole car-loads of such goods; the lowest rates in these latter cases being relatively very low indeed, as will be seen from the following exhibit:

Rates per 100 *Kilos.* (220 *lbs.*) *per* 1,000 *Kilometres.*

	Marks.		Marks.
Parcels	11.20	Half car-load, special	5.12
General merchandise, five-ton lots	6.90	Car-load special, I	4.62
		" " II	3.62
General merchandise, ten-ton lots	6.10	" " III	2.32

In English measures the mileage rates, which are at the basis of this tariff, are approximately as follows, on the Prussian state railroads:

	Cents per ton per mile.		Cents per ton per mile.
Express	9.0		
Parcels	4.5		
Half car-loads, general	2.8	Half car-loads, special	2.1
Car-loads, general	2.5	Car-loads special, I	1.8
		" " II	1.4
		" " III	1.0

But there is another class of goods, which forms the bulk of German traffic, where even the mileage principle is abandoned. A large part of the coal business comes under this head, and no small portion of certain other lines of traffic. Until recently, certainly, these special rates (*Ausnahme Tarife*) violated the short-haul principle. The rate on grain from Bremen to Cologne in 1886 was 12 marks, while from an intermediate station, 6 kilometres short of Bremen, it was 15 marks 50 pfennigs. In some of these exceptional tariffs rebates are given by the state railroads for coal exported from Germany. In other words, the German government is forced by the laws of trade to do on its own railroads what the Inter-state Commerce Commission is trying to stop on ours.

The majority of exceptional tariffs in Germany do not violate the short-haul principle. They simply carry grouping to a great extent. That is to say, they make rates the same for a longer distance as for a shorter one. Take, for instance, coal rates to Bremen and to Hamburg, respectively. The collieries in the Rhenish district are divided into three groups. Each of these groups has a fixed rate for shipments to Bremen and Hamburg, group one being charged 49 marks, group two 50, and group three 51. The noticeable thing, however, is that the rates to Hamburg and Bremen are made the same although the distance to the former port is nearly fifty per cent. greater than the latter. This is on the basis of one fixed consignment per week. If two fixed consignments are sent regularly every week for a year, a reduction is made of one mark for every ten tons; for three fixed consignments weekly, two marks reduction; for four fixed consignments weekly, three marks reduction; for five fixed consignments weekly, four marks reduction; for six fixed consignments weekly, five marks reduction. Nor is this grouping applied in favor of Hamburg only, but also to a variety of other ports. Bremen rates are given to Hasburg, 64 miles further distant, Hettfeld, 58 miles beyond Bremen, Bremerhafen and Guestemünde, each about 40 miles beyond, etc., etc.

These instances are sufficient to show that the German tariff in practice is very different from the German tariff in theory. In theory it involves a system with little or no classification except that between parcels and car loads, a system with equal mileage rates and with equal treatment of large and small shippers except for the car-load differences. In practice, however, the unclassified parcels goods amount to barely six per cent. of the whole. The car-load goods are classified according to value, in a more crude fashion perhaps than in America but no less distinctly, while on the large class of exceptional tariffs (*Ausnahme-Tarife*) mileage rates are abandoned, charges are determined by competition, and various things are done which would be in direct violation of the Inter-state Commerce act itself.

Now for the bearing of all this matter on the case before us. We are more anxious to point this out because our paragraph on the subject in the last issue has been somewhat misunderstood. We did not intend it as a reflection on the candor of the complainant's counsel. We simply believed that the German tariff had been misunderstood in good faith, and their supplementary paper from which our above schedule of German rates is in part quoted confirms us in that belief.

The Germans tried to make a systematic tariff. They had extraordinary advantages in this respect. To begin with, the Prussian government owned a great many railroads when the effort began, and has since come into possession of nearly all the others within its own territory; while the railroads of South Germany have been even longer under government hands. Further than this, the traffic of Germany is of an unusually stable character, much more so than that of the United States. There is some water competition, but not nearly so much as in America or in England. Last but not least, the Prussian civil service is an admirably efficient body, and the respect for police authority in that country is so great that "an official utterance" commands even more respect in Germany than it does in "Pinafore."

What has been the result? First, that in order to have any system at all they have been obliged to make a schedule of rates which has forced the business into car-load shipments. It is of little consequence to the present purpose whether the parcel shipments are classified or not. The car-load shipments are classified; and the car-load shipments have come to include the great bulk of the business of almost every kind. The government has found it good economy to develop matters in this way. The loss of car space and of car movement in the attempt to make a "natural system" of tariffs while retaining a parcels business has compelled them to give every kind of preference to car-load lots. They have done exactly what Mr. Sterne complains of. The question whether they have or have not done some other things which are done in America, seems to us, at this point, quite immaterial.

Further than this, even with the aid of the car-load system, they have found it impossible to secure the necessary economy in handling goods without giving additional advantages to the more regular shippers and making specially favorable rates for direct shipments between large places. This seems to us the most impressive lesson in the whole German tariff. The fact that they tried to do something different, and that they still pretend that they are doing something different, makes the inferences from what they actually do all the more convincing. With every advantage in their favor, they have not found it possible to run railroads in violation of the laws of railroad economy. If parcels shipments were expensive to the roads they were compelled to give special advantages to shippers in car-load lots. If fixed consignments were an advantage, they were forced to make direct allowance for regularity. If the competition of the world's business made special rates for special localities necessary, the government has been compelled to adopt that system on its own roads.

The Inter-state Commerce Law does a great deal to prevent the two last practices in the United States. Whether it prevents the first or not is an open question. Much will depend on the judgment of the Commission upon a really doubtful point. The lesson of the German tariff is that the government, which

wished to secure the utmost equality between different shippers, was unable to do it. Unless the Interstate Commerce Commission believes that it is more autocratic than Bismarck, we do not see how it can practically enforce the equality for which the complainants contend. It may be that the present discriminations in favor of car-loads are unduly high. This is a complicated question, and one where German practice can furnish us no guide. But with regard to the principle involved in making relatively low carload rates, the facts seem fully to warrant us in saying that German experience furnishes the strongest kind of precedent in that direction.

The Pullman Company and Second Class Sleeping Cars.

The success of the Pullman Company in bringing its stock up to 200 at a time of general depression in railroad securities is due to a combination of several causes. First and most important is the honest and skillful way in which the affairs of the company have been managed. Next comes its success in making arrangements with its competitors. This undoubtedly furnishes the immediate occasion for the rapid rise in the last few months. But apart from these causes directly connected with the management of the business, the general course of events in the railroad world has been favorable to the company's prosperity. Some of the things which have hurt the railroads have helped the palace car company. Take for instance the building of parallel lines. To the railroads this means low rates and disastrous competitive warfare. To the palace car company it may mean, and often does mean, the demand for twice as many cars. The rivalry between lines makes each of them anxious to offer the public every attraction within its reach. Pullman cars are precisely such an attraction. The multiplication of roads, even when carried to an unwise extent, thus increases the demand for these forms of equipment. Of course this state of things cannot last forever. The depression in railroad securities must sooner or later interfere with this demand. The fate of car trust securities in the latter part of the crisis of 1884-85 showed how this result might come about. But in the early stages of a crisis a strong car company is free from the direct influence of many of the causes which most severely depress the securities of the railroads themselves.

The general effect, as felt by the public and railroads in general, of the absorption of one considerable competitor and another of lesser proportions, is yet to be seen. Competition has given the American people many luxuries in this line and furnished them on lines which otherwise might have been much more frugally equipped. It is to be hoped that there will be no abatement in real comforts and conveniences.

The contract of the Pullman Company with the Atchison, Topeka & Santa Fe and its controlled roads probably involves changes which will affect the traveling public much more sensibly and directly than anything in connection with the purchase of the Mann cars. The Mann cars may in one sense be said to furnish a luxury one degree higher than can be afforded by the ordinary American sleeping car, and their acquisition gives the Pullman Company another addition to its facilities for giving people of ample means just what they want at all times. But Pullman's taking the management of the second class or "Tourist" sleepers of the Atchison is likely to materially hasten the time when there will be three classes of sleepers on all through trains of all the transcontinental lines, thus making an important change in the comforts and expense of the overland journey. It is already reported that he has made bargains with the other lines (excepting the Canadian Pacific), though there is no official confirmation of the report. On the Atchison he seems to have already taken hold. A Chicago paper says that cars designed and built by the Pullman Co. are already running between Chicago and the Pacific Coast. They have steam heating apparatus (continuous?), electric light appliances, are finished throughout in natural oak, furnished complete with mattresses, blankets, pillows, curtains, linen towels, etc., with toilet rooms for ladies and gentlemen. Each car is in charge of a conductor and porter. The rate is 50 cents for a berth for a night or $4 from Chicago to San Francisco, San Diego or Los Angeles.

The original idea of General Manager A. N. Towne (who first furnished poor people with sleeping cars, putting them on the emigrant trains from Ogden to San Francisco, some ten or fifteen years ago) has been somewhat slow in developing. Regular sleepers have served the well-to-do, and the free emigrant sleeper was a great boon to the poor man with a large family who had barely money enough to take him to his new home; but the idea of adapting a mean between these two, for the "great middle class" of passengers, apparently did not make its appearance with the customary Yankee promptness. It has, however, made commendable progress within the last year or two. Who deserves the credit for first metamorphosing the dirty and foul-smelling emigrant sleeper into a neat vehicle, for a ride in which clean people were glad to pay 50 cents or $1 a night, we cannot tell; suffice to say, that it must have been an eminently "business" mind, for the commission extracted from the operation was fat enough to be quickly reached for when once it was discerned. The development of the business, from the scheme of the skirmishing passenger agent, who engaged the car, got a carload of congenial people together, and reaped his own compensation simply by giving them a clean car (plus a 50 cent mattress), to the present plan of running regular second-class sleepers, on daily trains, with furnishings and attendants and under management almost identical with the management of the road itself, is to be attributed to competition. Competition not only between rival roads, but between the tourist agents and Pullman; for they (the tourist agents) have certainly aimed to increase the accommodations more and more, until they should get a satisfactory share of the first-class travel, or rather of the passengers who would naturally desire to travel first-class. Whether the competition between the roads will be sufficient to maintain progesss after the Pullman gets full control, as vigorously as if there were not so complete a monopoly, remains to be seen. The advantages of these cars are obvious to all, and the certainty that their field may be indefinitely enlarged seems self-evident. Their appearance in a regular daily line to and from Chicago suggests their use still further east, and we shall doubtless soon see an extension in that direction. In fact, free sleeping cars have already been run from Boston to New Orleans in trans-continental excursions.

Iowa Freight Rates.

That there will be a marked falling off in freight receipts on the railroads of Iowa, and that the volume of business on the lines of that state is not sufficient to warrant such a heavy reduction in rates as the Commissioners have ordered, is clear; but the gross amount of the probable loss, and the amount of decrease which would be justifiable, is not so easily determined. The effect of the Iowa laws on through business has not yet even been estimated, as the new rates have not been in effect long enough to base an inter-state tariff upon them. We give, however, a table showing the rates prescribed for the "Class A" roads (the larger lines), with the rates heretofore in force shown immediately under them for comparison; and in connection therewith a brief résumé of the history of the past seven months. The "B" roads were allowed to charge 15 per cent. and "C" roads 30 per cent higher than these rates, but it is doubtful whether this will be of advantage to them, as competition will compel them in many cases to make rates as low as the "A" roads.

The Iowa Railroad Commission upon the 5th of July last issued a new mileage schedule for maximum rates to be charged by the railroads of the state for freight transportation, as also a new classification based mainly upon the Illinois Commission's classification. The new classification averaged, as closely as can be estimated, 3½ per cent. lower than the Western classification which had formerly been in force and about 2 per cent. lower than the Illinois classification. The new distance tariff was also materially lower than that previously in force. In spite of the remonstrances of the Iowa managers the Commissioners ordered the new rates put into effect and declared them valid on the date named. The accompanying table shows some examples of the distance tariff in force previous to July 5 as compared with the rates ordered to take effect on that date (but which have only now been put in force by the roads). The total reduction as per the face of the distance tariff of July 5 was about 20 per cent., but a calculation made by the various lines of the quantities of freight actually handled showed, it was claimed, when taken in connection with the new classification, a difference which would cause a diminution of about 30 per cent. in gross receipts on purely Iowa business. While the reduction on inter-state rates which would be necessitated by the lower Iowa rates was smaller, it was estimated that the reduction on all business touching Iowa would be fully 20 per cent. The Burlington, the Rock Island and the St. Paul roads applied for an injunction in the United States Circuit Court to prevent the Iowa Commissioners from putting their new schedule into operation, and a restraining order was issued by Judge Brewer until such time as the case could be more fully argued and additional evidence presented. Subsequently the Iowa Commissioners issued a second tariff with but little change in the distance rates, but going back to the Western classification, thus raising rates for first-class roads virtually about 3½ per cent. Upon the issuing of this schedule, the Rock Island road withdrew its petition on the ground that the obnoxious original tariff had been done away with. The Burlington and St. Paul roads, however, filed a supplemental bill claiming that the Commissioners were endeavoring to evade the provisions of the restraining order.

After the filing of Judge Brewer's opinion of Feb. 2, the various roads running through Iowa notified the Commissioners that they would accept the rates so established, but under protest pending an appeal to the United States Supreme Court. The Rock Island prints its protest on all tariffs thus:

NOTICE!

The rates named in this schedule are unreasonably low, and are accepted only for the purpose of avoiding harassing and vexatious litigation threatened by the Railroad Commissioners of the state of Iowa pending the settlement of important questions by the Supreme Court of the United States.

We stated last week that the Burlington would refund overcharges for all business affected since the announcement of the Commissioners' tariff. The statement should have been "since the announcement of Judge Brewer's decision," as appears from the full copy of President Perkins' letter. This road was the first to announce its acceptance of the new rates; it now appears that a mistake was made, and the company announces that it has discovered that the Commissioners' schedule only covered those things which jobbers dealt in and manufacturers used, and hence would reduce its rates only on the five classes and on lumber, while retaining the old rates on wheat and other cereals, flour, millstuffs, salt, live stock, etc.

The mileage in Iowa of the three principal lines is: Chicago, Burlington & Quincy, 798; Chicago & Northwestern, 1,163; Chicago, Milwaukee & St. Paul, 1,573. Judge Brewer said in his decision that the Burlington road's freight business purely local to Iowa constituted only about four per cent. of its total traffic.

Train Accidents in 1888.

The past year has furnished a record far in advance of 1887, which we characterized a year ago as the worst year in our history, and this in spite of the omission of accidents outside the United States. Up to the end of 1887 there was a constant sprinkling of Canadian train accidents, and one of these, that at St. Thomas, Ont., in July, 1887, will be remembered as a disastrous one. We have to report an increase of nearly 50 per cent. in derailments, and of nearly 15 per cent. in collisions. There is hardly an item in the list of causes that does not show an increase.

The causes of the most fatal accidents, as shown in the table of casualties,* are seen to be still overwhelmingly heavy under the head of Negligence. This is still further apparent when the *number of accidents* causing death or injury is counted up. The list of killed and injured, especially of employés, in the "Negligence" column maintains a constant high figure, while the other column are fluctuating and smaller. The worst accident of the year, next to Mud Run, was the derailment at the Blackshear trestle in March, and that had to be classed as "unexplained." We have never heard of any investigation of its cause being made. Another accident in Georgia (in November) was reported to have killed five passengers, but we have seen nothing definite in print concern-

*This table excludes injuries to trespassers and to persons outside the roadway, such as the 16 killed and 49 injured at Locust Gap, Pa., and Fountain, Col., in May.

COMPARISON OF THE IOWA COMMISSIONERS' REVISED RATES WITH THE IOWA DISTANCE TARIFF OF MAY 10, 1888.
(Average decrease in all articles about 20 per cent.)

TARIFFS.	Miles.	Merchandise. 1.	2.	3.	4.	5.	A.	B.	C.	D.	E.	Wheat, etc.	Corn, etc.	Lumber.	Salt, etc.	Horses and mules.	Cattle and calves.	Hogs.	Sheep.	Hard coal.	Soft coal (lump).	Soft coal (slack).
Com'rs....	5	14.	11.9	9.34	7.	4.9	5.	4.9	4.2	3.5	2.8	4.5	3.75	3.5	3.25	14.00	11.20	10.08	8.96	80	55	41
Present...	5	15.	12.8	10.	7.5	6.	6.	4.5	3.8	3.4	3.	5.5	5.	5.	4.	12.50	10.00	10.00	8.00	68	34	27
Com'rs....	15	15.6	13.26	10.4	7.8	5.46	5.6	5.46	4.68	3.9	3.12	4.9	4.09	3.82	3.53	15.18	12.16	10.94	9.72	88	61	45
Present...	15	19.	16.2	12.7	9.5	7.6	7.6	5.7	4.8	4.3	3.8	6.5	5.7	5.7	4.7	16.25	13.00	13.00	10.40	86	43	34
Com'rs....	25	17.	14.45	11.34	8.5	5.95	6.	5.95	5.1	4.25	3.4	5.3	4.43	4.14	3.81	16.36	13.11	11.80	10.48	96	67	49
Present....	25	23.	19.6	15.3	11 5	9.2	9.2	6.9	5.8	5.2	4.6	7.5	6.3	6.25	5.3	18.13	14.50	14.50	11.60	1.04	52	42
Com'rs....	50	20.	17.	13.34	10.	7.	7.05	7.	6.	5.	4.	6.3	5.25	4.9	4.51	19.31	15.46	13.95	12.38	1.14	79	59
Present....	50	28.	23.8	18.7	14.	11 2	11.2	8.4	7.	6.3	5.6	10.	8.	7.5	7.	21.25	17.00	17.00	13.60	1.26	75	60
Com'rs....	75	22.	18.7	14.67	11.	7.7	8.	7.7	6.6	5.5	4.4	7.3	6.	5.6	5.2	22.36	17.81	16.05	14.27	1.29	89	60
Present....	75	33.	28.1	22.	16.5	13.2	13.2	9.9	8.3	7.4	6.6	12.	9.5	8.75	8.5	24.38	19.50	19.50	15.60	1.48	97	78
Com'rs....	100	24.	20.4	16.	12.	8.4	9.	8.4	7.2	6.	4.8	8.1	6.75	6.3	5.85	25.20	20.16	18.15	16.12	1.44	99	74
Present....	100	38.	32.3	25.3	19.	15.2	15.2	11.4	9.5	8.6	7.6	14.	11.	10.	10.00	27.50	22.00	22.00	17.60	1.72	1.20	96
Com'rs....	150	32.	25.3	19.5	15.3	11.3	12.5	10.7	9.2	7.7	6.4	9.5	7.9	7.4	6.85	29.40	23.56	21.20	18.82	1.74	1.16	89
Present....	150	45.	38.3	30.	22.5	18.	18.	13.5	11.3	10.1	9.	16.	13.	11.	11.	33.75	27.00	27.00	21.60	2.02	1.55	1.24
Com'rs....	200	40.	30.2	23.	18.6	14.2	15.9	13.	11.1	9.39	8.	10.8	9.	8.4	7.8	33.60	26.88	24.20	21.50	2.04	1.32	99
Present....	200	50.	42.5	33.3	25.	20.	20.	15.	12.5	11.3	10.	17.	14.	12.	12.	40.00	32.00	32.00	25.60	2.26	1.90	1.52
Com'rs....	250	48.	35.1	26.5	21.8	17.1	19.2	15.25	13.05	10.99	9.5	12.15	10.15	9.45	8.8	37.80	30.25	27.05	24.20	2.24	1.50	1.13
Present....	250	55.	46.8	36.7	27.5	22.	22.	16.5	13.8	12.4	11.	18.	15.	13.	13.	46.25	37.00	37.00	29.60	2.48	2.20	1.76
Com'rs....	300	56.	40.	30.	25.	20.	22.5	17.5	15.	12.5	11.	13.53	11.25	10.5	9.75	42.00	33.60	30.80	26.88	2.40	1.65	1.23
Present....	300	60.	51.	40.	30.	24.	24.	18.	15.	13.5	12.	19.	16.	13.8	14.	52.50	42.00	42.00	33.60	2.70	2.50	2.00

ing the cause of that, either. Of the passengers killed about 25 were either in the caboose of a freight train or upon an engine or similar irregular place. This is a point to be remembered when estimating the degree of safety of general passenger travel. Of the "other persons" killed, over 40 were tramps or other persons upon railroad premises *wholly* without right.

The classification of casualties, according to the kind of accidents in which they occurred, sums up for the year as follows:

KILLED.	Collisions.	Derailments.	Other acc'ds.	Total, 1888.	1887.	1886.
Employés	192	217	25	434	406	292
Passengers	89	78	1	168	207	115
Others	36	29	..	65	43	
Total	317	324	26	667	656	407
Total, 1887	287	330	39	656	...	...
Total, 1886	171	214	22	407	...	...
INJURED.						
Employés	537	538	23	1,098	890	742
Passengers	355	645	12	1,012	916	736
Others	57	35	2	94	140	
Total	949	1,218	37	2,204	1,946	1,478
Total, 1887	871	1,031	44	1,946	....	....
Total, 1886	516	815	78	1,409	....	....

The more prominent causes of collisions are shown in the following table:

CAUSES OF COLLISIONS.

	1888.	1887.	1886.	1885.
Train breaking in two	67	55	81	65
Misplaced switch	61	44	41	33
Failure to give or to observe signals	62	53	30	17
Mistake in giving or understanding orders	40	42	27	27
Miscellaneous	130	87	43	47
Total explained	360	281	222	189
Unexplained	444	419	279	275
Total	804	700	501	464

That our accounts are gathered from the newspapers, and are, therefore, far from perfect; that the "passengers injured" is an unsafe column in which to make comparisons, because of the different standards of reporting, and that for these and other reasons our totals and our deductions must be "handled with care," and used chiefly for comparison, we suppose is now well known to our readers.

There is much discussion about alleged irregularities in trunk line rates from the West to the seaboard. Grain receipts at Baltimore are unusually heavy and dealers at other points complain. The maintenance of rates by the principal lines seems to have had the same effect as holding one's hand over the mouth of a water faucet: the pressure is not destroyed and the water spurts out wherever it finds an opening. It is stated that nearly all the corn from western Iowa and Nebraska is going via St. Louis and the Ohio & Mississippi to Cincinnati and Baltimore, and by the Chesapeake & Ohio to Newport News. Other reports have it that some is going from Nebraska to St. Paul and thence eastward. The Wabash Western is accused of cutting rates on live stock as well as grain from Chicago to the seaboard. These reports originate in Chicago, which also complains of the lines which connect the West with the East immediately south of that city. All unusual movements in traffic are attributed to cutting of rates, and in the Baltimore matter New York joins Chicago in its wail. The only definite allegation is that the lighterage and elevator companies at Baltimore are manipulating rates for the benefit of the road with which they are connected. It is said that some Baltimore grain merchants have been buying corn at the West at prices which would net them a loss of 5 to 10 cents per 100 lbs. if the rate of transporation was according to the tariff. Certain figures of receipts are given as follows:

RECEIPTS OF GRAIN, BUSHELS.

Month of December:

	1888.	1889.	Inc. or Dec.	P. c.
Philadelphia	1,423,109	1,344,629	D. 78,480	5.52
Baltimore	2,497,243	3,457,430	I. 960,187	38.45
Two ports	3,920,352	4,802,058	I. 881,707	22.77
New York	8,160,950	9,952,282	I. 1,781,332	21.82

Four weeks ending Jan. 26:

	1888.	1889.	Increase.	P. c.
Philadelphia	666,568	1,198,314	531,846	79.79
Baltimore	439,842	2,665,508	2,225,666	529.00
Two ports	1,106,414	3,863,822	2,757,412	249.00
New York	3,107,900	7,212,900	4,105,000	132.00

The time of the Golden Gate Special has been shortened, and a through train between Chicago and Denver, via the Chicago & Northwestern and the Union Pacific, has been put on. The Golden Gate Special now leaves Council Bluffs at 9:45 a. m., instead of 8, and arrives at San Francisco two hours earlier than before, making the running time through 60 hours actual time and 58 hours apparent time, which is 3¾ hours shorter than before. This reduction, which, it will be seen, can be made with but a slight acceleration of the running speed, indicates the ease with which a through schedule from New York to San Francisco can be arranged so as to save one more day than at present, and the changes now announced may perhaps be taken to indicate a purpose in this direction. If the train were to leave Council Bluffs at 12:45 noon, it could reach San Francisco before 11 p. m., without running at a faster rate than that now prescribed for it, and a departure from Council Bluffs at the time named would admit of an easy connection at Chicago with the train arriving there from the Atlantic seaboard on Tuesday night at 9:30. This last mentioned train leaves New York at 6:30 Monday evening, so that passengers would have all day Monday in New York and all day Saturday in San Francisco. The east-bound train now leaves San Francisco at 8 o'clock Saturday night, and arrives in Council Bluffs Tuesday afternoon at 3:45, the trip being shortened one hour. The Denver express leaves Chicago at 5:30 p. m. and runs through in 36½ hours. The Burlington, the Rock Island and the Northwestern now each run one solid train through daily each way between Chicago and Denver. The Chicago, Milwaukee & St. Paul runs a through sleeper to Denver, via Council Bluffs, and the Wabash Western runs a through sleeper from St. Louis to Cheyenne via Kansas City. The Union Pacific runs a through sleeper from Council Bluffs to Salt Lake City, and the Chicago & Alton runs a through sleeper to Denver via Kansas City and the Union Pacific.

A railroad commission for New Jersey, on the plan of the Massachusetts commission, is proposed by the New England Society of Orange, N. J., and an elaborate abstract of the proposed law has been published. It provides that the board shall investigate the causes of any railroad accident resulting in death or serious injury, and that the board shall examine all highway grade crossings, as well as crossings of one railroad by another, and make recommendations. The members of the board are authorized to act as arbitrators in any disputed cases under this head. The opinion of the board that any structure which it has examined is unsafe shall be conclusive evidence of negligence in any suit. There are numerous other stringent sections, the most novel being that which requires the board to examine into the financial condition of any railroad on the written request of a director or any one owing one-fiftieth of its capital stock or an amount of its bonds equal to one-fiftieth of the stock. The result of such

TRAIN ACCIDENTS—THEIR NATURE AND CAUSES FOR SIXTEEN YEARS.

	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1873-7.†
TRAIN-MILEAGE in the U. S. in millions of train miles*	690.0	644.0	569.8	560.2	541.3	538.0	476.0	...	....	....	....	....
COLLISIONS:												
Rear	404	362	338	316	288	413	388	366	274	206	142	155
Butting	311	309	127	120	138	177	160	146	141	86	70	96
Crossing and miscellaneous	89	29	36	28	27	39	33	24	22	19	8	43
Total collisions	804	700	501	464	445	630	581	536	437	310	220	295
DERAILMENTS:												
Broken rail	61	50	45	102	60	84	37	85	45	56	17	71
Loose or spread rail	42	31	81	65	68	88	72	29	21	19	29	31
Broken bridge or trestle	40	39	20	32	34	35	38	44	16	17	21	24
Broken or defective switch	29	23	7	13	9	12	2	5	5	2	1	9
Broken or defective joint	1	....	1	....	....	1	3	4	....	....	2	4
Broken or defective frog	16	7	20	11	11	7	4	2	2	....	2	5
Bad track	....	2	....	....	....	....	....	....	....	....	....	5
Total defects of road	189	152	174	223	182	227	156	169	89	94	72	149
Broken wheel	48	27	37	41	22	40	33	58	21	21	5	22
Broken axle	44	45	62	48	30	60	52	50	30	30	18	32
Broken truck	27	8	14	18	12	24	14	10	7	11	13	10
Failure of coupling or draw-bar	7	4	3	6	3	2	....	....	1	2	4	4
Broken parallel or connecting-rod	1	1	....	....	....	....	1	1	2	....	....	1
Broken car	4	1	....	....	....	....	....	1	3	....	1	1
Loose wheel	1	2	....	....	....	3	1	4	....	2	....	2
Fall of brake or brake-beam	9	10	6	10	....	....	....	....	....	....	....	3
Other defects of equipment	7	2	....	....	....	....	1	....	....	....	....	....
Total defects of equipment	148	100	122	123	67	129	102	124	64	66	41	76
Misplaced switch	70	49	68	55	82	89	90	85	80	80	48	76
Rail (or bridge) removed for repairs	3	4	4	4	2	9	2	12	4	4	5	9
Making flying switch	....	2	....	....	2	4	....	1	1	....	....	1
Runaway engine or train	14	6	2	....	3	1	2	1	5	1	2	2
Running through siding	....	....	....	....	....	5	1	3	5	3	6	3
Open draw	4	3	2	5	5	4	6	2	1	2	4	4
Careless running	4	2	....	....	....	....	....	....	1	....	....	1
Badly loaded or overloaded car	8	....	....	....	....	....	....	....	....	....	....	1
Bad switching	14	8	....	....	....	....	....	....	....	....	....	....
Total negligence in operating	117	74	76	64	94	112	101	104	98	90	65	97
Cattle on track	57	32	36	25	28	45	48	42	43	35	30	48
Snow or ice	22	6	27	30	7	13	5	15	8	22	13	20
Wash-out	19	11	23	22	25	25	23	18	17	11	36	28
Land slide	34	16	21	7	18	16	7	14	4	7	4	6
Accidental obstruction	20	31	17	17	42	53	37	45	25	24	26	38
Malicious obstruction	14	12	15	15	12	12	17	13	8	11	15	15
Wind	....	7	1	6	3	19	5	3	3	3	1	2
Flood over track	3	....	....	....	....	....	....	....	....	....	....	....
Rail or switch purposely misplaced	22	12	24	13	17	16	....	....	....	....	....	....
Other unforeseen obstructions	2	2	3	....	....	....	2	....	....	....	....	....
Total unforeseen obstructions	193	129	167	135	152	199	144	150	108	113	125	158
Others	....	7	....	....	....	....	....	....	1	2	3	5
Unexplained	385	243	102	136	186	250	238	310	237	192	175	223
Total derailments	1,032	705	641	681	681	926	741	857	597	557	481	709
ACCIDENTS WITHOUT COLLISION OR DERAILMENT:												
Boiler explosions	15	14	19	11	16	13	12	14	14	17	11	18
Cylinder explosions	7	2	2	....	2	5	1	1	3	1	1	3
Broken parallel or connecting rod	22	17	22	28	17	26	11	21	13	15	11	10
Broken axle	7	5	3	2	7	8	4	1	3	1	....	3
Cars burned while running	7	8	8	9	13	13	7	8	6	4	13	9
Broken wheel	1	4	....	8	4	7	1	20	....	....	....	....
Broken tire	1	1	1	1	....	1	1	....	....	3	....	....
Other breakages of rolling stock	6	23	2	6	2	7	3	....	1	2	2	10
Other causes	33	12	12	7	4	4	2	....	4	....	1	6
Total without collision or derailment	99	86	69	72	65	84	42	65	44	43	39	61

RECAPITULATION.

Collisions	804	700	501	464	445	630	581	536	437	310	220	295
Derailments	1,032	705	641	681	681	926	741	857	597	557	481	709
Other accidents	99	86	69	72	65	84	42	65	44	43	39	61
Total	1,935	1,491	1,211	1,217	1,191	1,640	1,364	1,458	1,078	910	740	1,067

* Train mileage is taken from Poor's Manual, which gives *revenue* mileage only; that for 1888 is estimated.
† Average per year, five years, 1873 to 1877, inclusive.

CASUALTIES TO PASSENGERS IN TRAIN ACCIDENTS IN 1888.

Tabulated According to Classes of Causes.

	Defects of road.				Defects of equipment.				Negligence in operating.				Unforeseen obstruction and maliciousness.				Unexplained.				Total.			
	Pass.		Emp.		Pass.		Emp.		Pass.		Emp.		Pass.		Emp.		Pass.		Emp.		Pass.		Emp.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
January	2	52	4	16	12	8	2	5	4	25	24	57	....	3	6	21	....	28	7	8	18	116	43	107
February	1	20	5	32	1	14	2	12	2	19	8	35	....	3	4	8	....	9	2	12	4	65	21	99
March	1	18	8	17	....	9	4	4	....	36	20	43	....	....	15	26	29	39	6	13	30	102	53	103
April	1	24	....	11	....	1	6	10	....	28	10	58	6	25	12	16	1	6	5	12	8	84	33	107
May	....	3	5	4	....	2	3	12	2	28	12	37	1	1	3	6	1	16	....	....	4	50	23	59
June	....	9	5	25	1	....	3	4	3	19	16	24	....	....	1	7	2	25	5	7	6	53	30	67
July	....	....	3	3	....	....	7	9	....	24	14	39	....	10	8	16	6	37	16	25	6	71	48	92
August	....	31	5	15	....	6	5	9	....	13	23	50	....	31	10	18	....	9	....	8	....	90	43	100
September	....	3	1	11	....	....	....	7	7	102	12	34	4	30	8	8	....	19	8	5	11	154	29	65
October	....	....	....	2	....	3	....	9	70	61	34	92	....	3	6	12	....	32	5	5	70	99	45	120
November	....	28	....	6	....	3	2	11	1	14	19	61	....	....	3	14	5	23	1	11	6	68	25	106
December	....	7	9	11	2	19	1	....	3	19	25	49	....	....	1	11	....	15	5	11	5	60	41	73
Year	5	195	45	153	16	65	35	92	92	388	217	573	11	106	77	163	44	258	60	117	168	1012	434	1098
Year 1887	139	406	48	142	11	50	39	57	48	279	218	486	*	*	*	*	9	181	101	205	207	916	406	890

* Included in unexplained.

examination is to be published in the city in the State where the road has its principal office, and also in Trenton. The board shall have at all times access to lists of stockholders, with power to make copies.

The open-hearth steel gun cast by the Standard Steel Casting Co., of Thurlow, Pa., was tested at the Annapolis proving grounds Feb. 7. Two shots were fired with 36 lbs. of powder each, followed by 10 shots of 48½ lbs. of powder, with 100-lb. shells, fired at intervals of about two minutes. It is reported that the test was entirely satisfactory. The examination of the gun before firing showed a defect too slight to be detected by the star gauge, and the gauging and examination since the tests reveal some minute scores also too narrow to be measured. So far as can be ascertained from the published reports, the gun is likely to be serviceable. The success of this experiment is encouraging to the great number of engineers and manufacturers who have hoped to see cast steel used largely for heavy guns in this country, and will perhaps lead to further attempts on the part of the Pittsburgh Steel Casting Co. to make a Bessemer gun.

The recent strike on the horse car lines in the City of New York naturally had a very important influence on the business of the elevated roads. The number of passengers carried in the seven working days from Jan. 29 to Feb. 5, inclusive, was 4,486,283, against 3,399,385 last year, the increase being 1,086,898, or about 32 per cent. In the eight days, including Sunday, the increase was 1,227,501, or about 33 per cent. The number of passengers carried daily in the seven week days of this year averaged 640,898, varying from a minimum of 607,000 on Tuesday, Feb. 5, to a maximum of 687,000 Saturday, Feb. 2. In the corresponding week of 1888 the average number of passengers carried daily for seven working days was 486,000, varying from 461,000 on Tuesday, Jan. 31, to 552,000 on Monday, Feb. 6. The increase in the daily average was 155,272. The greatest number of passengers ever carried in any single day before this was 637,000 Dec. 24, 1888.

TECHNICAL.

Analysis of Omaha & Grant Lead.

Below we give the result of an analysis of "Omaha Lead," produced by the Omaha & Grant Smelting & Refining Co., of Omaha, Neb. During the discussion of Mr. Bennett's paper on anti-frictional journal bearings, at the last meeting of the Western Railroad Club, this brand of lead was referred to by Mr. Townsend, who stated that he had been more successful with it, in journal bearings, than with other brands that he had tried. We have received this analysis from the company. It shows the lead to be almost pure. The percentage of antimony, which was expected by some to be very great in this brand, is in reality very small. Recently antimony and lead have become a favorite mixture among railroad men for use in lining journal bearings. The alloy used by the Union Pacific, together with the method of lining, is noted in another column.

Analysis.

Lead	99.96873
Iron	.0006
Zinc	.0005
Arsenic	.0005
Bismuth	.0005
Silver	.00017
Copper	Trace
Antimony	.0012
	100.00000

The Rail Market.

Steel Rails.—The sales during the week have amounted to 20,000 tons, principally for southern delivery. Quotations remain nominally at $27@$27.50 at Eastern mills.

Old Rails.—Sales have aggregated 1,500 tons of tees at a price equal to $23.50 at Jersey City. A sale of 1,000 tons of tees at $24.50 in Western Pennsylvania is also reported.

Track Fastenings.—An order was placed this week with a western mill for 15,000 tons of angle bars. Spikes are quoted at $2@$2.10, and angle bars $1.80@$1.85 delivered.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In New York the Federal Court decides that where a railroad company has misapplied its earnings as against an income mortgage, and a decree allows the income bondholders to move for an injunction against further misapplication, and the company relies on a bare denial of a charge of misapplication, giving no figures from which the condition of its business or the manner of disposing of its earnings can be determined, and giving no explanation of the shrinkage of its semi-annual net earnings from $1,449,463 to zero, an injunction will be allowed, though for a cause other than the particular one formerly had in view, and though the charge is in part on information and belief.[1]

In Pennsylvania the Supreme Court holds that a state tax on the gross receipts of railroads cannot be evaded by the fact that the railroad company is a foreign corporation and has sent such receipts to its home office, so that they are not physically within this state. But a state statute taxing the gross receipts of transportation companies derived "from tolls and transportation, telegraph business, or express business," is not valid, so far as such receipts are derived from commerce between points within and points without the state. Such statute is valid, however, as to all receipts derived from commerce wholly confined within the limits of the state; and this, although the company doing the business is a foreign corporation.[2]

In Pennsylvania the Supreme Court decides that to authorize a judgment declaring railroad mortgage bonds void, in a suit brought for that purpose, the bondholders must be given their day in court personally; it is not sufficient that the mortgage trustees are made parties and served with process, where there is nothing to show that they were authorized to represent the bondholders.[3]

In Indiana the Supreme Court rules that a railroad corporation cannot be prosecuted for crimes and misdemeanors where it is in the hands of a receiver, who has full possession of its property and entire charge of its affairs.[4]

In Georgia the Supreme Court holds that a statute of that state providing that the legislature may confer power upon municipal corporations to permit and sanction encroachments on their streets for a reasonable compensation in money to be paid into the city treasury does not confer authority upon the mayor and council of a city to grant to a railroad company a block of land 80 by 480 feet, in one of the busy streets of the city, for a passenger and freight depot, to the injury of adjoining property holders.[5]

Carriage of Goods and Injuries to Property.

In Iowa the Supreme Court holds that a carrier is liable for goods consigned to the shipper and delivered without orders to a person who ordered the goods and to whom the shipper had sent an unindorsed bill of lading, drawing on him through a bank for the price, and accompanying the draft with another bill of lading and an order for the goods to be delivered on payment of the draft, though the company was ignorant of the sending of the bill of lading and draft, as well as of the fact that the goods were not paid for. The existence of a local custom to deliver goods on the presentation of an unindorsed bill of lading at the place where the delivery was made, the shipper having no knowledge of it, is no defense to an action for the value of goods so delivered.[6]

In Georgia, in an action against a railroad company for two fires, one of which was alleged to have been caused by sparks cast from defendant's engine upon plaintiff's premises, and the other upon combustibles on defendant's right of way, there was testimony that, soon after a train had passed, smoke was seen in plaintiff's orchard, and that the fire had started on the line between plaintiff's and the company's land, and was going away from the track. It was also testified that engines on that road sometimes threw sparks 40 ft. beyond the right of way. It also appeared that after the second fire grass and weeds on the right of way were found partially burned. The Supreme Court decides that the company is liable; that it was proper to instruct the jury that they might consider all the evidence in the case, and assess the damages as a whole, whether the fire originated by sparks cast upon plaintiff's premises or by igniting combustibles on defendant's right of way, and that the measure of damages is not the cost of replacing the trees the first proper season for planting after the fire, and the value of the care and labor bestowed on the destroyed trees before the burning, with interest, but the value of the trees destroyed.[7]

Injuries to Passengers, Employes and Strangers.

In Texas the Supreme Court holds that a railroad company cannot by contract with a passenger limit or exempt itself from liability for injuries resulting from its own negligence or the negligence of its servants. A person who goes with cattle on a railroad, to feed, load, and unload them, does not become an employé of the company by signing an agreement that he should be deemed an employé and that the company should be exempt from all liability for injuries to him; the contract of shipment providing that the owner should do all such work at his own expense and risk, and that, if the company should furnish help therefor, such help should be deemed employed by the owner.[8]

In Massachusetts the Supreme Judicial Court rules that a passenger upon a railroad car who is unnecessarily and improperly upon the platform, knowing that the train is about to start, and who is thrown down and injured by the starting of the engine with no unusual or unnecessary jerk, cannot recover from the railroad company for the injuries received.[9]

In New Hampshire the Supreme Court holds that a passenger station, within the meaning of the statute which forbids the ejecting of a person from the car for nonpayment of fare except at a passenger station, must be a stopping place where passenger tickets are ordinarily sold.[10]

In Georgia the Supreme Court rules that if the purchaser of a round trip ticket, after paying for and receiving it, performs all the stipulations of the contract on his part, or offers to do so in proper time and manner, the company is bound to recognize and honor the ticket when and wherever duly presented, notwithstanding any mistake or omission by its agents in signing or stamping the same.[11]

In Indiana the Supreme Court rules that a female passenger required to alight from a car attached to a freight train some 80 rods beyond the station, was not guilty of negligence in failing to discover gates into a private inclosure through which the station might be reached by an unmarked route. She was constructively a passenger in following the railway track back to the station, and was not guilty of negligence in attempting to cross a cattle pit, and for injury there suffered the company was liable.[12]

In Virginia the Federal Court holds that where one enters the service of a railroad as brakeman, with knowledge of the fact that there are overhead bridges on the road, which are dangerous, and of the bridge which caused his injury, and, being possessed of sufficient intelligence as to the danger, and how to avoid it, is struck by the bridge while standing upright on the top of a car, he cannot recover, although a minor.[13]

In Georgia the Supreme Court rules that when a gravel or a repair train is managed as usual, and the jerk complained of is only such as would be expected to occur on a train of that character in doing its work, the employés engaged on it or attached to it take the risk as incident to the service, and if injured by the jerk, cannot recover of the company.[14]

In Ohio it is ruled by the Federal Court that when a plaintiff's injuries are wholly caused by the defendant's negligence, but are aggravated by his own subsequent and independent acts, and the jury apportion the damages, he is entitled to recover to the extent of the damage without his fault, but not for that portion caused by his subsequent acts.[15]

In Wisconsin the evidence showed that deceased was killed in attempting to drive his team over a crossing on a side track in a city where trains unloaded at about the same time daily, though whether deceased knew that fact was uncertain; that he could not see the track for a long distance in the direction the cars came, the view being obstructed by buildings until his horses' heads were 4 ft. from the crossing, when he could see the track for 30 ft.; that it was questionable whether the bell or whistle was sounded, or, if so, whether, owing to the wind and buildings, deceased could have heard it; that it was also doubtful whether deceased was notified that the cars were coming; that he drove at a walk, and only the heads of the horses were over the track when the corner of a car caught the collar of one, turning them about, upsetting the wagon, throwing deceased under the cars, thereby killing him; that, while lawful speed was six miles an hour, the cars were moving at the rate of eight, and that there was no sign at that point. The Supreme Court affirms a judgment against the company.[16]

In Iowa one in attempting to drive over a railroad crossing, in which were 10 tracks, distant from each other about four feet, was struck by a train while on the last track and killed. Cars standing on the tracks prevented him from seeing the approaching train until he had passed the seventh track, and the jury found that he would have passed safely over had the train not been running at a higher rate of speed than was allowed by the city ordinance. The crossing was planked, and there was nothing to cause delay in passing on it. The Supreme Court holds that, being a resident of the city, intestate would be presumed to have known of the ordinance, and had a right to presume it would be obeyed, and was not negligent in attempting to cross after seeing the train.[17]

In Iowa the defendant and two other railroad companies had two other crossings near the one where the injury occurred, and all were used by each road in common. Each company employed and paid one of the flagmen, and the flagman at the crossing where the injury occurred was employed and paid by defendant. The Supreme Court holds that defendant was liable for his negligence, although at the time of the injury he was flagging a train owned by another company.[18]

In Massachusetts the Supreme Judicial Court holds that where a person is injured upon a railroad crossing over which it does not appear that any one had a right of way, unless from the license or invitation of the railroad company, the company cannot be held liable for negligence unless it is shown that it had invited or induced such use of the crossing. An invitation to the public to use a crossing over a railroad may be established by the use permitted by the company, even if the crossing leads to private premises, and not necessarily to any public way beyond.[19]

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1 Barry v. M., F. K. & T. R. Co., 36 Fed. Rep., 228.
Del. & H. Canal Co. v. Com., 13 Cent. Rep., 493.
2 Harrisburg & E. R. Co.'s Appeal, 13 Cent. Rep., 488.
3 State v. Wabash R. Co., 15 West Rep., 449.
4 Daly v. Ga. S. & F. R. Co., 7 S. E. Rep., 146.
5 Weyand v. A., T. & S. F. R. Co., 39. N. W. Rep., 899.
6 N. & W. R. Co. v. Bohannan, 7 S. E. Rep., 237.
7 Mo. Pac. R. Co. v. Ivey, 9 S. W. Rep., 346.
8 Torrey v. B. & A. R. Co., 7 N. Eng. Rep., 148.
9 Baldwin v. Grand Trunk R. Co., 7 N. Eng. Rep., 111.
10 Head v. Georgia Pac. R. Co., 7 S. E. Rep., 217.
11 N. Y., C. & St. L. R. Co. v. Doane, 15 West. Rep., 465.
12 Goff v. N. & W. R. Co., 36 Fed. Rep., 209.
13 Central R. Co. v. Simms, 7 S. E. Rep., 176.
14 Owens v. B. & O. R. Co., 35 Fed. Rep., 715.
15 Wenstanley v. C., M. & St. P. R. Co., 37 N. W. Rep., 856.
16 Schmidt v B., C. R. & N. R. Co., 39 N. W. Rep., 916.
17 Buchanan v. C. M. & St. P. R. Co., 39 N. W. Rep., 663.
18 Hanks v. B. & A. R. C., 7 N. Eng. Rep., 139.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Charlotte, Columbia & Augusta, quarterly, 1 per cent., payable Feb. 27.

Chicago & Alton, quarterly, 2 per cent., payable March 1.

Coudersport & Port Allegheny, 6 per cent.

Kansas City, Ft. Scott & Memphis, semi annual, 4 per cent. on the preferred stock and 1½ per cent. on the common stock, payable Feb. 15.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atchison, Topeka & Santa Fe, annual meeting, Topeka, Kan., May 9.

Atlanta & Charlotte Air Line, annual meeting, 48 Wall street, New York, March 13.

Chicago, St. Louis & New Orleans, annual meeting, Memphis, Tenn., March 29.

Delaware, Lackawanna & Western, annual meeting, 26 Exchange Place, New York, Feb. 19.

Illinois Central, annual meeting, 78 Michigan avenue, Chicago, Ill., March 13.

Kansas City, St. Louis & Chicago, annual meeting, St. Louis, Mo., March 12.

Mississippi & Tennessee River, annual meeting, Memphis, Tenn., March 29.

Missouri Pacific, annual meeting, St. Louis, Mo., March 12.

New Orleans & Northeastern, annual meeting, New Orleans, La., March 4.

New York, Susquehanna & Western, annual meeting, Jersey City, N. J., Feb. 28.

Peoria, Decatur & Evansville, annual meeting, Peoria, Ill., March 5.

St. Louis, Iron Mountain & Southern, annual meeting, St. Louis, Mo., March 12.

Texas & Pacific, annual meeting, 195 Broadway, New York, March 6.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Institute of Mining Engineers* will hold its nineteenth annual meeting in New York city, Feb. 19. The hotel headquarters will be at the Union Square Hotel.

The *National Association of Railway Surgeons* holds its annual convention in St Louis, Mo., May 2, 1889.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tifft House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street New York.

The *Boston Society of Civil Engineers* holds its regular meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in St. Louis on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Gerard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7.30 p. m. at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Kansas City* meets at Kansas City, Mo., on the first Monday in each month.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7.30 p. m. on the third Saturday in each month.

The *Civil Engineers' Club of Kansas* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

American Institute of Mining Engineers.

The 53d meeting of the Institute, being the annual meeting, will, as has already been announced, be held in New York, beginning Tuesday evening, Feb. 19. Mr. Andrew Carnegie is Chairman of the local committee, and Mr. William H. Wiley, 15 Astor place, Secretary. The headquarters will be at the Union Square Hotel.

American Society of Civil Engineers.

It is announced in a circular just issued by Mr. Charles E. Emery, Chairman of the Special Committee on European

Trip, that responses received up to this date indicate that there will be a sufficient number from the Mechanical Engineers and the Institute of Mining Engineers to fill one steamer and a sufficient number from the American Society to fill another. The Committee of the American Society proposes to charter an Inman steamer at such rates that the round trip can be made for $110, which pays for the passage out on the special steamer and a return ticket on any steamer of the line. Members proposing to make the trip are requested to remit at once, and assignment of rooms will be made in the order in which passage is paid for, giving precedence, however, to ladies. An alternative and somewhat cheaper plan is under consideration by which the round trip could be made by the steamers of the National Line. It is said that the special steamer will probably sail on May 23.

Association of Maintenance of Way Engineers of the Pennsylvania Railroad.

This is an organization composed of the Assistant Chief Engineer of the Pennsylvania Railroad, four Engineers of Maintenance of Way and the Assistant Engineers of the New York, Philadelphia, Middle and Pittsburgh divisions, and of the West Jersey and the Camden & Atlantic railroads. The organization has a membership of ten. The object of it, as stated in the constitution, is the discussion and general improvement of maintenance of way standard of the Pennsylvania Railroad. Regular meetings are held monthly, and inventors or owners of patent railroad appliances are not permitted to be present at the meetings. The chairman is Mr. Joseph T. Richards, Assistant Chief Engineer, Philadelphia, and the Secretary, W. Hayward Myers, Assistant Engineer Philadelphia Division, West Philadelphia.

Engineers' Club of Kansas City.

A meeting was held Jan. 21, at which Henry Goldmark and Gerald Bourke were elected members. A committee was appointed to report on the matter of the transfer of membership between the various local societies. A paper by Mr. A. N. Connott on Electric Railways was read and discussed, and a paper was read on Shrinkage of Material and Settlement of Embankments.

The annual dinner of the club was held Jan. 28, 33 members being present. The list of toasts includes 13 topics and a dozen different speakers.

A regular meeting was held Feb. 4, Messrs. Rollin Norris, A. J. Tullock, R. H. Bacot and A. R. Meyer were elected members; Messrs. O. Chanute, George H. Nettleton and Charles F. Morse were elected honorary members. A paper on the Details of Iron Highway Bridges was read by E. W. Stern, bringing out the especial merits of the Schwedler truss for long spans.

Engineers' Club of St. Louis.

A regular meeting was held Feb. 6. Edward B. Wall, Henry Groneman and Nils Johnson were elected members. Professor Johnson read a paper on the strength and design of cable conduit yokes. The paper gave the results of a number of tests made on different forms of yoke at the laboratory of the Washington University, and was illustrated by sketches. The author submitted a design for a new yoke made of cast iron, strengthened by a steel or wrought-iron tension member. In discussing the paper Mr. Holman thought the proposed design would prove a success. He stated that the most important question now affecting the cable lines was the amount of contraction of the yoke. It is not yet known whether this will continue or whether a permanent shape will be reached. Should the contraction continue most of the present designs of yoke will break. The difficulty of keeping the slot open will be a very serious expense. The paper was further discussed by several members, who spoke of the stresses brought upon yokes by the freezing of the ground and of the difficulty of maintaining a permanent width of slot. Mr. Russell brought up the question of closer organization among the engineering clubs of the country. Messrs. S. B. Russell, J. A. Sedon and J. B. Johnson were appointed a committee to devise a scheme for closer union among the societies in the Association.

New York Railroad Club.

The next meeting of the New York Railroad Club will be held at its rooms, 113 Liberty street, New York, on Thursday evening, Feb. 21, at 7:30 p.m.

The subject for discussion will be Heating and Lighting Passenger Cars. Mr. E. E Gold, of the Gold Car Heating Co., will open the meeting by reading a paper on the development and progress which has been made in heating cars by steam. This will be followed by papers relating to other systems of heating. H. R. Waite, Ph. D., of the Railway Electric Car Lighting & Signal Co., will read a paper on lighting cars by electricity, and will make an exhibit of electric lighting; the Pintsch Gas System will also be exhibited at this meeting.

Northwest Railroad Club.

The subject for the next meeting of this club is "The best method of heating passenger cars in the Northwest."

Western Railway Club.

The next regular meeting of this club will be held at the rooms, Phenix Building, Chicago, Feb. 19, at 2 o'clock p. m. The subjects for discussion will be "Standard Axles for 60,000-lb. Cars," to be opened by Mr. G. W. Rhodes, Superintendent of Motive Power of the Chicago, Burlington & Quincy; and "Tender Trucks," to be opened by Mr. John Hickey, Master Mechanic of the Milwaukee, Lake Shore & Western.

PERSONAL.

—Mr. Douglas Green, who has been President of the Covington and Macon road during its construction, has resigned that position.

—Mr. L. A. Mackey, President of the Bald Eagle Valley road, a leased line of the Pennsylvania, died suddenly at Lock Haven, Pa., this week, of heart disease.

—Mr. W. M. Hughes, Bridge Engineer in the City Civil Engineer's office at Cleveland, O., has accepted the position of Assistant General Manager of the Keystone Bridge Works, at Pittsburgh, Pa.

—Mr. John S. Lentz, who has been so long and favorably known as Master Car-Builder of the Lehigh Valley, has been promoted to be Superintendent of the Car Department, reporting direct to the Second Vice-President.

—Mr. Joseph O. Osgood, Chief Engineer of the Lake Shore & Michigan Southern, has resigned that position, to take effect at the end of this month. Mr. Osgood has held this position for a little over a year, and was previously Chief Engineer of the Toledo, St. Louis & Kansas City.

—Col. Frank R. Parrott, the son of Henry R. Parrott, of the Parrott Varnish Co., died in Bridgeport, Jan. 30, after a brief illness, at the age of 29. Col. Parrott was an aide on the staff of Gov. Bulkeley of Connecticut. The funeral was largely attended, among those present being the Governor and Lieutenant Governor.

—Mr. Amos L. Hopkins has resigned his positions as Second Vice-President of the Missouri Pacific and the St. Louis, Iron Mountain & Southern roads. Mr. Hopkins remains a member of the boards of directors of both roads, and also of the Executive Committee and the sub-committee on expenses in both companies.

—Mr. Cornelius H. Delamater, founder of the Delamater Iron Works of New York, died at his home in that city from pneumonia, Feb. 7 at the age of 68. Mr. Delamater had been connected with the iron business since he was 16 years old. During the war he did a great deal of work for the Government, especially on the monitors of Capt. John Ericson. Many of the inventions of Capt. Ericson have been constructed at these works.

—Hon. Samuel N. Bell, of Manchester, N. H., died suddenly at North Woodstock, N. H., Feb. 8, of heart disease. He had been a director of the Concord, Manchester & Lawrence and Boston, Concord & Montreal roads, and at the time of his death was clerk and director of the Profile & Franconia Notch and Whitefield & Jefferson railroads, Director and President of the Suncook Valley, Pemigewasset Valley and Concord & Portsmouth railroads, and clerk of the Boston, Concord & Montreal.

—Mr. H. N. Turner, Traffic Manager of the Lowell System, Boston & Maine road, and General Freight and Passenger Agent of the Boston & Lowell, White Mt. Division, has resigned. George W. Storer has been appointed to succeed him as General Passenger Agent of the White Mt. Division of the Boston & Lowell, and D. C. Prescott succeeds him as General Freight Agent of that division and W. F. Berry, Assistant General Freight Agent on the Boston & Maine, succeeds him as General Freight Agent of the St. Johnsbury & Lake Champlain road.

—Mr. John T. Moore, recently elected President of the Kentucky & Indiana Bridge Co., vice Col. Bennett H. Young, who declined a re-election, is a leading merchant and banker of Louisville. Mr. St. John Boyle, the new Vice-President, is Vice-President of the Louisville, Evansville & St. Louis road, a director of the Louisville Southern, and Vice-President of the Louisville City Railroad. Mr. C. P. Weaver, the new Secretary and Treasurer, is at present Assistant Postmaster at Louisville, Ky.

ELECTIONS AND APPOINTMENTS.

Anniston, Oxford & Choccolocco Valley.—This company has been chartered in Alabama by the following: E. Lock, S. N. Milligan, O. M. Davenport, A. J. Little, C. S. Whiteside, R. J. Riddle and J. F. M. Davis, all of Calhoun county.

Atchison, Topeka & Santa Fe.—The following changes and appointments have been made: Thomas Downing, Division Master Mechanic at Topeka having resigned to accept another position, G. W. Smith has been appointed Division Master Mechanic at that place. D. C. Courtney has been transferred from Coolidge to Nickerson, Kan., to take the place made vacant by Mr. Smith's transfer. H. A. Bearns has been appointed Division Master Mechanic, with headquarters at Coolidge, Kan.

Barnegat Park.—The officers of this company are as follows: President, John B. Larner, of Washington, D. C.; Vice-President, Edward S. Farrow, and Secretary and Treasurer, William L. Bruen, of Barnegat Park, N. J.

Bath & Hammondsport.—At the annual meeting held this week the following directors were elected: F. M. McDonald, Wayne; M. F. Sheppard, W. S. Morris, Penn Yan; T. M. Younglove, D. Bander, Hammondsport; W. W. Allen and F. Campbell, Bath. The directors chose the following officers: Morris F. Sheppard, President; F. M. McDonald, Vice-President; D. Bander, Secretary; Frank Campbell, Treasurer; Monroe Wheeler, Attorney.

Beech Creek & Hudson River.—The directors of this new company are: Samuel Nevins, C. L. R. Myers, W. Evans, T. Brady, E. F. Lukens, C. Kennedy, of Philadelphia, and R. C. Bellville, of Trenton, New Jersey.

Belt Railroad & Stock Yard Co. (Indianapolis).—The stockholders of the road held their annual meeting in Indianapolis last week, and elected as directors for the ensuing year: W. R. McKeen, W. P. Ijams, R. S. McKee, Horace Scott, John Thomas, Michael Sells, M. A. Downing, B. Deming and D. W. Minshall. Michael Sells takes the place of John F. Miller. W. R. McKeen declined a re-election to the Presidency, and the following officers were chosen: W. P. Ijams, President and General Manager; R. S. McKee, Treasurer and Secretary, and W. D. Ernst, Auditor.

Birmingham, Union Springs & Bainbridge.—The following are the incorporators of this Alabama company: J. H. Rainer, Herman W. Smith, N. H. Frazier, F. M. Moseley, C. C. Frazier, L. Bernheimer, G. M. Hanson, W. A. McAndrews and C. B. Chapman.

Boston & Maine.—George W. Stores has been appointed General Passenger Agent of the White Mt. Division, Boston & Lowell, vice H. N. Turner, resigned. D. C. Prescott has been appointed General Freight Agent of the White Mt. Division, and W. C. Berry, General Freight Agent of the St. Jonnsbury & Lake Champlain, vice H. N. Turner, resigned.

Chicago & Northwestern.—R. B. Barger has been appointed Passenger Agent in Australia, to begin on March 1.

Cincinnati, Hamilton & Dayton.—J. L. Orbison has been appointed Superintendent of Telegraph, to succeed L. P. Minier, resigned.

Cleveland & Marietta.—T. DeWitt Cuyler has been chosen Vice-President.

Coudersport, Hornellsville & Lackawanna.—The officers and directors of the company are as follows: Officers: President, D. C. Larrabee; Secretary, C. L. Peck; Treasurer, H. J. Olmsted, all of Coudersport, Pa. Directors: P. A. Stebbins, Coudersport; Wm. Dent, A. B. Crowell, Brookland; Thos. Coulston, Genesee Forks, Pa.; Amos Raymond, F. A. Raymond and M. B. Perkins.

Coudersport & Port Allegheny.—The stockholders of the road elected the following officers last week: President, F. W. Knox; Vice-President, C. S. Cary; Treasurer, M. W. Barse; Secretary, A. B. Mann; Superintendent, B. A. McClure.

Cumberland Valley.—R. H. Middleton, superintendent and manager of the Harrisburg & Potomac, has resigned and accepted the office of general freight agent of the Cumberland Valley, with headquarters at Hagerstown, Md.

Harrisburg & Potomac.—Harry Bomberger has been appointed superintendent, to succeed R. H. Middleton, resigned.

Empire & Dublin.—The company has elected the following officers: J. C. Anderson, President, Chattanooga, Tenn.; J. W. Hightower, Vice-President and Treasurer, Empire, Ga.; E. H. Nall, Secretary, Chattanooga, Tenn.

Hornellsville, Coudersport & Lackawanna.—The stockholders of this recently chartered company have elected the following officers: President, D. C. Larrabee; Secretary, C. L. Peck; Treasurer, H. J. Olmstead. Directors: A. B. Crowell; P. A. Stebbins, Wm. Dent, Thomas Coulston, F. A. Raymond, W. B. Perkins and A. F. Raymond.

Kentucky & Indiana Bridge Co.—At a directors' meeting, held at Louisville, Ky., Feb. 8, the following officers were elected: President, John T. Moore; Vice-President, St. John Boyle; Secretary and Treasurer, Charles P. Weaver. John T. Moore was elected a director in the place of T. W. Bullitt resigned.

Keokuk & Western.—At the annual meeting of the stockholders held in Keokuk last week, the following directors were chosen: Felix T. Hughes and John N. Irwin, Keokuk; F. M. Drake, Centreville, Iowa; G. H. Candee, B. Strong, John Paton, W. H. Gebhardt and Adam W. Speise, New York; T. De Witt Cuyler, Philadelphia.

Lehigh Valley.—The title of Mr. John S. Lentz, Master Car Builder has been changed to that of Superintendent of the Car Department. He will have entire charge of all the cars and car shops of the company, except the passenger car shops at South Easton and Delano, Pa.

Louisville Southern.—W. H. Adams has been appointed Superintendent, vice A. J. Porter, resigned. John Jerome has been appointed Chief Train Dispatcher at Louisville, Ky.

Memphis, Birmingham & Atlantic.—The stockholders of the road met in Memphis, Feb. 18, and re-elected the old Board of Directors. The directors elected the present officers, including President George H. Nettleton.

Milwaukee, Lake Shore & Western.—Charles H. Hartley has been appointed Superintendent of the Northern Division, with office at Ashland, Wis.

Mobile & Ohio.—The annual meeting of the general bondholders of the company was held in New York last week, and the following directors were elected: William Butler Duncan, J. E. Clarke, Adrian Iselin, jr., Sidney Shepard, H. B. Plant, R. K. Dow, John Paton, Frederick D. Tappen, A. H. Stevens, W. I. Hearin, T. G. Bush, E. L. Russell and James H. Fay. The only changes in the board are the substitution of Messrs. Paton and Tappen for two retiring directors.

Monongahela Connecting.—At the recent annual meeting of the stockholders of this company Henry A. Laughlin was re-elected President, with the following board of directors: B. F. Jones, Thomas M. Jones, George M. Laughlin, Willis L. King, William L. Jones and James Laughlin, Jr. The directors elected the following officers: Vice-President and Treasurer, James Laughlin, Jr.; General Manager, W. C. Quincy; Secretary, Benjamin Page.

New York, Susquehanna & Western.—Geo. W. Waite, Trainmaster of the New York Division of the Pennsylvania, has been appointed Superintendent of this road, to succeed R. D. McKelvey, resigned, to accept service with the New York Central & Hudson River.

Northern Pacific.—S. R. Ainslie, Assistant General Manager of the Eastern Division, has been appointed General Superintendent of the whole line, and N. D. Root has been appointed Assistant General Superintendent, both with offices at Helena, Mont.

Pensacola & Memphis.—The stockholders have elected the following directors: W. B. Wright, Pensacola, Fla.; W. W. Hungerford, J. P. Walker, Meridian, Miss.; A. W. Johnston, G. H. Kimball, W. I. Bliss, Cleveland, Ohio; Clark Hayes, Bradford, Pa.

Philadelphia & Erie.—These managers were elected at the annual meeting held in Philadelphia this week: W. Hassell Wilson, J. N. Du Barry, Wistar Morris, Samuel Gustine Thompson, Amos R. Little, N. Parker Shortridge, Henry D. Welsh, W. J. Howard, W. L. Elkins and J. Bayard Henry. Mr. Little takes the place of the late Mr. Wetherill, and Mr. Henry of Edmund Smith, who has resigned.

Philadelphia, Germantown & Chestnut Hill.—The following directors have been elected: President, Henry Houston. Directors: Alexander Biddle, J. N. DuBarry, John P. Green, H. A. Houston, N. Parker Shortridge and J. C. Sims, Jr.

Pittsburgh, Butler & Shenango.—The following are the directors of this company: President, Samuel B. Dicks. Directors: P. C. Hollis, Henry M. Dechert, R. V. Massey, Jr.; R. H. C. Hill, John McCleave and A. F. Henlein; Secretary, Bernard Gilpin.

Richmond & Chesapeake.—The stockholders of the company have elected J. B. Pace, T. C. Leake, Jr., S. G. Tinsley, A. Monteiro and T. A. Cory directors.

St. Louis, Arkansas & Texas.—The office of the General Manager has been removed from Texarkana to St. Louis, Mo.

San Francisco & North Pacific.—J. W. Mellory has been appointed Secretary of this system.

Sheffield & Seaboard.—The incorporators are David Clopton, B. Steiner, Horace Ware, M. L. Ernst, A. H. Moses, O. O. Nelson, J. R. Adams, M. L. Moses, W. L. Chambers, C. D. Woodson, J. F. Burke, H. C Moses, T. R. Roulhac, S. Steiner, J. V. Allen, L. B. Musgraves, and J. H. Nathan, all of Sheffield, Ala.

Suffolk & Carolina.—Charles H. Jones, Jr., has been appointed General Manager of the company, with headquarters at Suffolk, Va.

Summit Range.—Directors were elected this week as follows: G. B. Roberts, I. J. Wistar, A. R. Little, J. N. DuBarry, Wistar Morris, A. J. Cassatt, J. P. Green, W. J. Howard, N. P. Shortridge, W. H. West, and George F. Swift.

Union Pacific.—General Manager T. L. Kimball has issued a circular announcing the following changes and appointments: C. S. Mellen, having resigned the position of Assistant General Manager, has been appointed Traffic Manager, with headquarters at Omaha, Neb. He will have charge of freight and passenger business, and will report to the General Manager. E. Dickinson has been appointed Assistant General Manager, in charge of the lines east of Cheyenne, with headquarters at Omaha, and will report to the General Manager. Superintendents within Mr. Dickinson's jurisdiction will report direct to him. H. A. Johnson, having tendered his resignation, to take effect March 1, J. S. Tebbets has been hereby appointed to the position of First-Assistant General Freight Agent, to take effect on that date, with headquarters at Omaha, Neb. E. L. Lomax has been appointed General Passenger Agent, vice Mr. Tebbets, promoted, with headquarters at Omaha. Appointment taking effect March 1. T. W. Lee has been appointed Assistant General Passenger Agent, vice Mr. Lomax, promoted, with headquarters at Omaha.

Waverly & New York Bay.—The following are the incorporators of this new company: Hugh B. Ely, Beverly, N. J.; Robert H. Goff and William Taylor, Riverside; William J. Sewell and W. N. Barnard, Camden; J. N. DuBarry and J. P. Green, Philadelphia.

Western & Atlantic.—At the annual meeting of the road Feb. 8 the following officers were elected: Joseph E. Brown, President; R. A. Anderson, General Manager; Joseph M. Brown, Traffic Manager; C. T. Watson, Secretary and Treasurer; J. C. Courtney, Auditor; Executive Committee, Joseph E. Brown, W. T. Walters, H. B. Plant, E. W. Cole, H. I. Kimball and W. D. Grant. The President appointed J. L. Dickey General Freight Agent, Alton Angier General Passenger Agent, and Charles Beardsley Master of Trains.

West Side.—The following are the officers of this company, just organized in New Jersey: G. W. Helm, President; H. W. Douty, Vice-President; George Holmes, Secretary, and F. H. Earle, Chief Engineer.

West Side Connecting.—The names and refidences of the incorporators, and directors for the first year of this company are: Dudley G. Gautier and George F. Gautz, of New York City; Livingston Gifford, Jacob J. Detwiller, George W. Helme, John M. Jones, Edlow W. Harrison and George Holmes, all of Jersey City, N. J.; Charles Siedler, of Morristown, N. J.; Frank H. Earle, of Newark, N. J., and Harry W. Douty, of Philadelphia, Pa. The following are the officers: G. W. Helme, President; H. W. Douty, Vice-President; George Holmes, Secretary, and F. H. Earle, Chief Engineer.

OLD AND NEW ROADS.

New Companies Organized.—Anniston, Oxford & Choccolocco.—Beech Creek & Hudson River.—Birmingham, Union Springs & Bainbridge.—Grand Island & Northern Wyoming.—Pittsburg, Butler & Chenango.—Sheffield & Seaboard.—Staunton & West Augusta.—Union Springs & Pensacola.—Waverly & New York Bay.—West Side Connecting.

Alabama & Vicksburg.—The Vicksburg & Meridian division of the Cincinnati, New Orleans & Texas Pacific system, which was sold under foreclosure suit last week, is to be reorganized under the above name.

Albion & Corydon.—Work is progressing on an extension of four miles to an extensive Oolitic stone quarry near Kings Cave, Ind. The company is itself doing the work. The rails (56-lb. steel) are being supplied by the North Chicago Rolling Mill Co.

Anniston, Oxford & Choccolocco Valley.—This company has been incorporated in Alabama to build a road from Anniston, through Dearmanville, Oxford and Choccolocco to White Plains, in Calhoun County. The capital stock is fixed at $200,000.

Baltimore & Ohio.—Work is now in active progress on the New Jersey approaches of the Arthur Kill Bridge. A long trestle is being built over the salt meadows between Elizabethport and Roselle, N. J., where it will connect with the Lehigh Valley.

Barnegat Park.—This New Jersey road will probably be built the coming summer from Barnegat Park Station directly to Barnegat bay front, passing through the village of Bayville. The surveys are now nearly completed, and already grading has been commenced under the company's immediate direction. Contracts, however, for constructing other parts of the line will soon be let.

Beech Creek & Hudson River.—A charter has been filed in Pennsylvania for a company of this name to build a road 26 miles long in Lycoming and Northumberland counties, and to extend from Newburg to Turbotville. The capital stock is $1,000,000.

Birmingham, Union Springs & Bainbridge.—The company has filed a charter in Alabama to build a road from Birmingham to a point on the Chattahooche River, in Henry County, Ala., 15 miles below Fort Gaines, Ga. The road will pass through Columbiana, Shorter's Depot, Union Springs, Clayton and Abbeville, in Alabama, and thence to the town of Bainbridge, Ga. The capital stock is $1,000,000.

Boston & Albany.—The Massachusetts House Railroad Committee has reported a bill granting the road authority to increase its capital stock by $10,000,000. The bill as reported allows the company to offer the new stock to the shareholders at par, and the price of the present stock has risen from about 201 to 215.

Canadian Pacific.—Contracts for building the extension from London to Windsor, Ont., have been let as follows: Angus Sinclair, of Chatham, and W. Doherty, of Montreal, for 50 miles from Windsor to near Chatham. The next section of 10 miles is awarded to W. Brown, of Chatham, and the next 10 miles to Hickson & Hutchinson, of St. Catherine's.

Charleston, Cincinnati & Chicago.—McDonald, Shea & Co., of Knoxville, Tenn., have the contract to build the line from Marion, N. C., to Minneapolis, Va., a point of junction of this road with the Clinch Valley extension of the Norfolk & Western, and thence northward to the Breaks of the Cumberland, a distance from Marion of about 250 miles.

Chicago, Burlington & Quincy.—The company is said to have engineers surveying a line from Bogard, Clay County, Mo., on the Chicago, Burlington & Kansas City, westerly across the southern part of Ray County, to a point on the Hannibal & St. Joseph in Carroll County.

Chicago & Northwestern.—The company is said to have surveyors in the field for a new line, to extend south from Yankton, Dak., to Hartington, Neb., a distance of about 20 miles. This would connect the Yankton branch of this road and the Chicago, Minneapolis, St. Paul & Omaha.

Cooperstown & Charlotte Valley.—Grading is still in progress at West Davenport, N. Y. on the extension from Cooperstown Junction to Davenport Centre, eight miles. It is reported that a further extension through East Meredith to Bloomville, will be made in the Spring.

Clarksburg, Weston & Glenville.—This company is making arrangements to change its track from 3 ft. gauge to standard this year. The road extends from Weston to West Clarksburg, W. Va., 25 miles. A. H. Kunst, of Weston, W. Va., is President.

Cleveland, St. Louis & Kansas City.—A contract for grading 30 miles of the road from Augusta, Mo., west, has been let to Stevens & Schaeffer, of St. Louis. Altogether 70 miles of the line is now under contract.

Dayton & Lebanon.—A survey for this new Ohio road is being made by H. Talbot, of Cincinnati. The line is to extend from the Union Depot at Dayton, along the east bank of the Great Miami River for 3 miles, then east through Centreville, Springboro, and thence to Lebanon. From Lebanon the road will probably enter Cincinnati over the Cincinnati, Lebanon & Northern, or else by an extension from Lebanon, connecting with the Little Miami road.

Deer Creek & Susquehanna.—A mortgage for $300,000 in favor of the Mercantile Trust Co., of New York, has been made on the road from Bellair to the Susquehanna River in Maryland, which it is expected to have completed by Oct. 1. The line will be operated as a part as a part of the Maryland Central.

Denver, South Park & Pacific.—The following is outlined as the plan upon which the reorganization of the company is to be effected. It is the result of negotiations between the Union Pacific and the first mortgage bondholders. Both of the old mortgages are to be foreclosed and a new company organized, which shall issue a first mortgage covering the whole road at the rate of $11,100 per mile, bearing 4½ per cent. interest. These bonds are to be put in trust as the basis of a 4½ per cent collateral trust bond, to be issued by the Union Pacific at the rate of $10,000 per mile. These bonds are to be given to the holders of the old first mortgage bonds, $1,800,000 (covering only 150 miles of road), at par, and their coupon due Nov. 1, 1888, to be paid at the new rate of 2¼ per cent. for the half year. All the bonds of the old consolidated mortgage are owned by the Union Pacific except $125,000, and the holders of these will also receive the new Union Pacific collateral trust bonds at par in exchange for their old bonds. The balance of Union Pacific bonds not thus disposed of can be issued for improvements on the property as they may be needed. The Union Pacific will own all the stock of the new company, to be issued at $10,000 per mile on the whole 325 miles.

Empire & Dublin.—About 10 miles of the extension east to Dublin, Ga., is now located, and by March 1 a large force of convicts will be placed on the grading, which will be light. As has been already stated, 10 miles of the road from Empire, east, is now completed and in operation, and it is expected to have the grading on the whole 42 miles from Hawkinsville, in Pulaski County, northeasterly through Empire, in Dodge County, to Dublin, in Laurens County, completed by Sept. 1. The road will open up large tracts of timber land, and also a good farming section. No contracts will be let for building the road. The Empire Lumber Co., of Chattanooga, Tenn., is the owner.

Evansville & Richmond.—A mortgage for $1,000,000 on the Western Division of the road has been filed in Indiana. The mortgage is due in 40 years and made payable to the Manhattan Trust Co., of New York, with interest at 5 per cent. The loan is to be used to build and equip the road from Elnora, in Davies' County, to Columbus, in Bartholomew County, by the way of Seymour, through the counties of Daviess, Martin, Lawrence, Jackson and Bartholomew; the Evansville & Terre Haute road, of which D. J. Mackey is President, guarantees the payment of the interest. This division of the road is to be completed by June 1, 1889.

Gardner, Coal City & Northern.—The company has filed a deed of trust in Illinois to secure an issue of bonds to the amount of $1,000,000. The Union Trust Co. of New York is trustee. The proceeds of the bonds are to be used in completing the road and equipping it with rolling stock.

Grand Island & Northern Wyoming.—The company has filed a charter in Wyoming to construct a line of road from the eastern boundary of Wyoming northwesterly through Converse and Cook Counties to the northeastern boundary line of the territory.

Grand Tower & Cape Girardeau.—Preliminary surveys have been completed from East Cape Girardeau north to Grand Tower, Ill. Locating surveys will probably soon be made. Col. Van Frank is Chief Engineer.

Houston, Central Arkansas & Northern.—The company has undergone another reorganization, and Mr. G. M. Dilley, of Palestine, Tex., and J. Henry, of Joliet, Ill., are now the active promotors of the line. A construction company has been organized, and it is expected to have the road between Bastrop and Columbia, La., 50 miles, completed early in the summer. In addition to the contracts already let, 600 convicts from the Louisiana Penitentiary will be put at work grading.

Keokuk & Northwestern.—The Master in Chancery will offer at public sale in Keokuk, Ia., March 1, the property of the Keokuk & Northwestern, extending from Mount Pleasant, in Henry County, via Keokuk, connecting with the St. Louis, Keokuk & Northwestern.

Knoxville Southern.—Tracklaying has been commenced on this road near Blue Ridge, where it connects with the Marietta & North Georgia road. Grading is in progress from this point north, to meet the line being constructed south from Knoxville, Tenn. The entire line from Knoxville to Blue Ridge is now under contract.

Lake Shore.—This line in New Hampshire has now been graded from Alton Bay northwest to Lake Village, a distance of 16 miles. The track will be laid the coming spring. The line is to connect the Lowell and Northern Divisions of the Boston & Maine system. J. K. Ryan & Co., of Ware, Mass., are the contractors.

Leesburg & Lake Region.—The survey for this Florida road has been completed from Stewart's Landing on Lake Apopka to Leesburg. A branch from Riverside to the Withlacooche River and an extension to the Gulf of Mexico are projected, making in all nearly 100 miles of road. The grades are slight and the work will be light. John F. Richmond is President.

Lincoln Park & Charlotte.—At a meeting of the stockholders, held in New York, Feb. 6, there was authorized the issue of $350,000 fifty year five per cent. bonds, to be guaranteed by a mortgage on the company's property, and it was also decided to lease the railroad and property to the Buffalo, Rochester & Pittsburgh Co. the latter company guaranteeing the bonds to be issued.

Los Angeles & Eastern.—The company expects to begin in March surveys from Los Angeles northeast through Pasadena and Kramer, Cal., 97 miles. There will be two tunnels, one 4,000 ft. and the other 2,000 ft. long. It is expected that the contracts for grading, etc., will be let in about four months. T. J. Cuddy is President and T. J. Rask is Chief Engineer. The office of the company is in Los Angeles.

Michigan Central.—The company has given notice that the track on the Lapeer and Northern branch, will be taken up. The branch extends from Lapeer, Mich., on the Bay City division of the road, northeast nine miles to Five Lakes, and large quantities of lumber have heretofore been transported over it each year.

Mississippi & Tennessee.—A meeting of the stockholders of this road and of the Chicago, St. Louis & New Orleans will be held in Memphis, March 29. The consolidation of this company with the Chicago, St. Louis & New Orleans will be considered, also an issue of bonds, secured by a mortgage on the road, and a lease of the company's property to the Illinois Central.

Missouri Pacific.—A party of engineers is surveying a line from Chetopa, Kan., via Baxter Springs and Galena to Joplin, Mo. The distance is about 35 miles.

New Brunswick.—Application will be made to the Legislature of New Brunswick for power to construct a road from the terminus of the Temiscouata road at Edmundston in the County of Madawaska to some point on the Intercolonial at or near Newcastle or between Newcastle and Moncton. Also a line extending from the main line to some point on the Intercolonial between Sussex and Saint John, or to connect with the Central road (now in course of construction) at or near the head of Grand Lake. By means of the Grand Trunk, Temiscouata and Intercolonial and the projected line through the centre of the province, a new and comparatively short route will be opened up between Montreal, St. John and Halifax.

New England Terminal Co.—This company, formed in the interest of the New York & New England and Housatonic roads to establish wharves at Norwalk, Conn., and transfer freight to and from New York City, has mortgaged all its rights, franchises, etc., to William H. Starbuck and Henry Hentz, to secure bonds to the amount of $800,000, issued at 5 per cent. and payable in 20 years.

New Roads.—Articles of incorporation have been drawn up under the General Railroad Act of New York for the purpose of forming a company with $200,000 capital, to build a road from Lockport to New Fane Station, and to connect with the Rome, Watertown & Ogdensburg at that place. The directors are Hon. William Spalding, John Hodge, E. M. Ashley, Edwin L. Jeffery, Willard T. Ransom, Frank P. Weaver and Charles A. Hoag.

New York & Long Branch.—This road is now laying 12½ miles of 76-lb. Scranton steel between Long Branch and Matawan, N. J. Last spring 2½ miles of Bethlehem steel of the same section was laid. This replaces the 62-lb. rail laid in 1881 and 1882, which, although not worn out, is found too light for the fast and heavy summer traffic. Between Long Branch and Point Pleasant a 70-lb. rail is used. Since the road has been jointly operated by the Central of New Jersey and the Pennsylvania, great improvements have been made. It has not only been double-tracked, but stone culverts and under-passes with iron pipe have superseded the old pile bridges. Wrought-iron draw-bridges have taken the place of cast-iron structures at Morgan and Oceanport. A 1,200-foot track tank has been put on the Red Bank trestle, by which engines take water while running for eight months in the year. Several new stations have been built and the station grounds have been put in fine order.

New York, New Haven & Hartford.—The directors at a recent meeting at New Haven decided to authorize the construction of a new transfer boat to take the place of the Maryland, recently destroyed by fire. The directors also authorized the survey of a connecting link, about seven miles long, between the Northampton division at Farmington and the New Britain branch of the Hartford Division.

New York, Ontario & Western.—The company will soon issue new securities for constructing the new extension from Hancock, N. Y., on the main line, southwest to Scranton, Pa., about 51 miles. It will be necessary to buy the right of way through many of the towns, and, it is expected that the cost of the line will be about $2,500,000. The new extension is expected to give the company a heavy coal traffic from Pennsylvania into New England via the Poughkeepsie Bridge connections.

Ossining.—The company has completed a survey from Whitson's Station to Sing Sing, N. Y., a distance of about 3 miles. J. C. Cockcroft, of Sing Sing, is President, and Thomas Stratford is Chief Engineer.

Pennsylvania.—It is generally understood that the company is to issue about $4,000,000 new capital stock, and that the stockholders will have the privilege of subscribing for the new stock at par when the next dividend is declared in May. The capital stock outstanding is $106,544,500. The money will be expended in the construction of the Jersey City elevated road, improvements of the roadbed of the New York division, the enlargement of the Broad street station in Philadelphia, straightening the track on the main line, and the purchase of additional equipment.

Philadelphia & Atlantic City.—The company proposes to issue $600,000 of preferred stock and to consolidate the road with the Camden, Gloucester & Mount Ephraim and the Williamstown & Delaware River roads. The roads are operated by the Philadelphia & Reading, and the consolidation is merely a formal matter.

Philadelphia & Reading.—Mayor Fitler of Philadelphia last week sent to the Councils the Terminal bill prepared by himself. The bill gives the company the right to construct an elevated road to Twelfth and Market streets, beginning at the New York junction, Fifteenth and Somerset streets. All the structure from Ninth street and Fairmount avenue to Twelfth and Market streets is to be built on the company's own property, except where it arches the streets. The other portion of the road will begin near the part at Thirteenth street and Pennsylvania avenue, and pass along the latter and Willow street to the Delaware River. The company must agree to remove its surface tracks in Willow street from Front to the west side of Broad street. The surface tracks west of Broad street and those along Ninth are to remain as they are, the elevated road to be constructed above them. These surface tracks are to be used for the transportation of freight only, and that only between the hours of 10 p. m. and 6 a. m. The bill has been referred to a sub-committee, the majority of whom are said to be not in favor of it.

It is stated that the company has under consideration an extension of the Quarryville branch from New Providence, Pa., southerly to a connection with the Deer Creek & Susquehanna road at the Susquehanna River, including the building of a bridge over that river. If built, this branch would give the Philadelphia & Reading an entrance into Baltimore, over the Maryland Central.

Pittsburgh, Butler & Shenango.—This company has been organized in Pennsylvania, and is a reorganization of the West Pennsylvania & Shenango road, which was bought in last month for $80,000 by a committee representing the first mortgage bondholders. The new company was formed in the interest of the purchasers. Nearly all of the bonds issued, amounting to $400,000, are held in Philadelphia. The road is 21 miles long, extending from Butler, Pa., to Coaltown, Butler County.

Prattsburg & Kanona.—The grading on this road has been completed for the first 10 miles from Kanona, N. Y., toward Prattsburg, and tracklaying is now in progress. It is expected that the road will be ready for traffic next spring, when it will be operated by the New York, Lake Erie & Western. W. L. Williams, of New York, has the contract for building the road.

Pullman Palace Car Co.—The directors have authorized an increase of $5,000,000 capital stock, to which stockholders of record between Feb. 16 and 21 may subscribe at par, at a ratio of one share to four of their holdings. Of the new issue $2,000,000 is to be used in payment for the recently purchased Union Palace Car Co.

Richmond & West Point Terminal.—The Attorney-General of Virginia has refused to proceed further in

the suit brought against the company to invalidate its charter. He expresses no opinion on the merits of the case, but bases his decision upon the ground that action should be taken in King William County, where the principl office of the company is located.

Rocky Fork & Cooke City.—The tracklaying on this road has been completed from Laurel, Mont., south across the Crow Indian Reservation by the contractors, Green, Keefe & Co. The line will be completed to the coal fields as fast as possible, and the company has already made several contracts for furnishing large supplies of coal.

St. Louis, Arkansas & Texas.—Three suits, aggregating $164,331, have been brought against the company by O. T. Lyon, surviving member of the firm of Burton & Lyon. The first suit is for $100,000 claimed to be still due for grading the line between Sulphur Springs and Sherman, Tex.; the second is for $38,331 for bridging and trestling on the line, and the third, for $26,000, is a test suit; about $130,000 was subscribed by residents of Sherman to have the road extended to that place; of this all but $26,000 was paid, which was withheld on the ground that the company had not fulfilled all the conditions of its contract. The contract taken by Burton & Lyon was to be partly paid by this subscription, and the suit is brought to determine whether the company is liable for this unpaid part.

St. Louis & San Francisco.—The Secretary of the Interior has confirmed the title of the company to the land in odd numbered sections on each side of the road in Missouri, from Springfield to the western line of the state. The General Land Commissioner decided that these lands were not covered by the grant of July 27, 1866; from this decision the company appealed, and it has been overruled. The title of the settlers on these lands is now confirmed.

St. Paul, Minneapolis & Manitoba.—The company is reported making active preparations for an early resumption of work on the extension of its line from Sioux Falls to Yankton, Dak.

San Diego, Cuyamaca & Eastern.—A first mortgage on the road for $6,250,000 was filed at San Diego, Cal., Feb. 7. It is in favor of the Mercantile Trust Co. of New York, and the rate of interest on the bonds is 6 per cent.

The troubles about the terminals of the road in San Diego, which led the company to threaten to build the line from Los Angeles are said to have been removed, and the work on the line will now go on. Tracklaying is nearly all completed on the first 20 miles from San Diego. The second section east from Lakeside, Cal., it now being located.

Santa Ana & Long Beach.—The surveys on this California road are making good progress, and will probably be completed this month. Three surveys will be run between Santa Ana and Long Beach, a distance of 20 miles.

Scranton & Forest City.—The surveys for this road are now nearly completed, and the right of way is being secured. Already considerable property has been purchased. Grading has been begun at Scranton, and it is claimed that the line will undoubtedly be built as now proposed. It is to extend from Scranton northeast to Forest City, Pa., a distance of 25 miles, and will pass through the following towns in Lackawanna County: Olyphant, Peckville, Archbald, Jermyn, Carbondale and smaller towns. The contract for building the road will be let early in April. E. B. Sturges and E. A. Clark are respectively President and Secretary of the company, with office at Scranton.

Sheffield & Seaboard.—A company has been organized at Sheffield, Ala., to build a line from Sheffield to the northern boundary line of Alabama, and from Sheffield to a point on the Gulf of Mexico. Preliminary surveys are now being made. The general offices are at Sheffield.

Southern Pacific.—The extension from Victoria, Tex., southeast to Beeville on the San Antonia & Aransas Pass, 57 miles, has been completed from the former place to Goliad, about 30 miles. Work is in progress on the rest of the line.

Springfield & Connecticut.—The surveys for this extension of the Hartford & Connecticut Western from Simsbury, Conn., north to Springfield, Mass., 18 miles, are being made by T. W. Burt, of Hartford. The road will be built in the spring.

Spokane Falls & Northern.—D. C. Corbin, formerly President of the Cœur d'Alene Railway & Navigation Co., has offered to build this road if $100,000 is subscribed to the capital stock, in Spokane Falls, W. T. The road is to extend from Spokane Falls north about 120 miles to a point on the Columbia River at the Little Dalles. A line of steamships to run on the Columbia is also projected.

Staunton & West Augusta.—This company has been organized at Staunton, Va., to build a road from that place northwest to West Augusta, a distance of about 20 miles. The road is intended to develop coal fields in Augusta County. John D. Crowle, of Staunton, is President, and W. P. Tams is Treasurer.

Tennessee Midland.—The extension east from Jackson, Tenn., to the Tennessee River, has been opened to Lexington in Henderson County, 113 miles east of Memphis. A large force is working east of Lexington.

Union Pacific.—In the case of the United States against the Union Pacific and others, involving the title to 115,000 acres of land near Denver, worth from $3,000,000 to $5,000,000, has been decided by Judge Brewer in favor of the company. The decision also gives title to ranchmen who purchased their lands from the company.

Union Springs & Chattanooga.—A company has been granted a charter by the Alabama Legislature at Montgomery, authorizing the construction of a line of railroad from Union Springs, Ala., to Chattanooga, Tenn., by a route not yet decided upon. Preliminary surveys will be made at once.

Waverley & New York Bay.—The company has been organized in New Jersey to build a line from Waverley on the main line of the Pennsylvania, between Newark and Elizabeth, easterly about six miles to a point on New York Bay. It is in the interest of the Pennsylvania and will enable it to run through freight trains around the city of Newark.

West Side Connecting.—This company has filed articles of incorporation in New Jersey to build a road from a point on the right of way of the Central of New Jersey, near Newark Bay Bridge in Bayonne City, Hudson County, N. J., to a point at or near the foot of West St. Paul's avenue, in Jersey City. The capital stock is placed at $500,000.

TRAFFIC AND EARNINGS.

Traffic Notes.

The Pennsylvania announces that it will hereafter divide extra baggage money collected by it pro rata with the roads over which the baggage travels, relying upon the good faith of connections to accord it equally fair treatment in return.

The Montezuma Special, on its first trip from New Orleans, Feb. 7, had 40 passengers.

The Inter-state Commerce Commission.

The Commission will meet at Chicago Feb. 19, to investigate the complaints against Chicago-St. Paul roads for not properly publishing and posting rates.

The case of Coxe Bros. & Co. against the Lehigh Valley, alleging discrimination in rates of transportation upon coal, in favor of bituminous and against anthracite, was heard by the Commission on Feb. 7, 8, 11 and 12. The complainants aver, first, that the railroad company favors the Lehigh Valley Coal Co., which is owned by the road, and, second, that the rate per ton per mile on anthracite, which is shipped from points averaging 130 miles from the seaboard, is very much higher than that upon bituminous coal, which originates 300 miles and more from tidewater. For the last ten years the rates on soft coal have been gradually reduced, while those on anthracite have remained the same. A large number of shippers and retailers of coal testified as to the course of their business. The output in the United States during 1888 was 40,000,000 tons of anthracite and 80,000,000 tons of bituminous. There is 100,000,000 tons of culm in Pennsylvania that could be used for steam producing if the roads would carry it at a sufficiently low rate. Several witnesses testified that the difference in the two coals, anthracite and bituminous, would not warrant any difference in freight rates. Anthracite coal is about 10 per cent. heavier than bituminous, and the cost of handling the latter is stated by one retailer to be 2 cents per ton the greater. Ten years ago nine-tenths of the coal used for steam producing in New England was anthracite, now nine-tenths is bituminous. W. H. Sayre, of the Lehigh Valley Coal Co., testified that his company received no favors from the railroad. The case was adjourned to March 1.

Central Traffic Association.

At the meeting of the passenger department in Chicago on Tuesday it was agreed to adopt the punch photograph rebate mileage ticket, as recommended by the committee last month. The description of the holder of the ticket is indicated by punch marks in the same manner as the date, etc., on limited tickets, and the price paid is high enough to allow of a rebate after the ticket is used up. The Wabash has already announced that its 2,000 mile tickets will hereafter be $50 each, with $10 rebate, when the ticket is used up.

The committee appointed to draft new articles of organization has made a unanimous report, proposing a plan which embodies numerous improvements over the old one. A board of arbitration is provided for.

Cleveland Weighing Bureau.

The report of Holland W. Davis, Joint Weighmaster of the Cleveland Weighing and Inspection Bureau, from June 1, 1888, when the inspection began, to Dec. 31, is given below. The Detroit & Cleveland Steam Navigation figures are from June 1 to Oct. 31 only, the Cleveland & Canton from July 1 to Aug. 21, and the Empire Line from Nov. 1 to Dec. 31. The figures given are in *thousands* of pounds:

	Ship's wt.	Act'l wt.	Excess.
Pennsylvania	49,215	55,600	7,444
L. S. & M. S.	41,094	47,576	6,511
N. Y., C. & St. L.	24,260	27,283	3,022
N. Y., P. & O.	8,215	9,253	1,038
C., C., C. & I.	8,389	9,324	935
Valley	3,448	4,135	687
D. & C. Nav. Co.	391	444	53
Cleveland & Canton	210	253	42
Empire Line	139	154	14
Total	135,335	155,086	19,751

This excess of 9,876 tons, discovered and corrected by the bureau, amounts to 13.85 per cent. of the freight inspected. Mr. Davis estimates that 60 per cent. of the excess discovered was fourth, fifth and sixth class freight, with an average rate of ten cents per 100 lbs. and 40 per cent. first, second and third class matter, with an average rate of 15 cents per 100 lbs. At these estimates the excess tonnage discovered would amount to $23,702; the estimated gain in changes of classification discovered is $1,206; deducting expenses of the bureau, $3,685, the net gain to the railroads for this period was, therefore, $21,223. Mr. Davis says that the percentage of excess weights obtained is as great now as when the bureau began business last summer.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Feb. 9, amounted to 61,891 tons, against 54,183 tons during the preceding week, an increase of 7,708 tons, and against 49,069 tons during the corresponding week of 1888, an increase of 12,822 tons. The proportions carried by each road were:

	W'k to Feb. 2.		W'k to Feb. 9.	
	Tons.	P. c.	Tons.	P. c.
Wabash	6,064	11.2	7,391	11.9
Michigan Central	4,367	8.1	4,737	7.6
Lake Shore & Mich. So.	7,125	13.1	7,101	11.5
Pittsburgh, Ft. W. & Chicago	6,716	12.4	7,216	11.7
Chicago, St. L. & Pittsburgh	6,238	11.5	6,600	10.7
Baltimore & Ohio	3,611	6.7	4,629	7.5
Chicago & Grand Trunk	10,549	19.5	12,412	20.1
N. Y., Chicago & St. Louis	4,507	8.3	5,690	9.1
Chicago & Atlantic	5,006	9.2	6,145	9.9
Total	54,183	100.0	61,891	100.0

Of the above shipments 3,663 tons were flour, 28,711 tons grain, 3,022 tons millstuff, 4,210 tons cured meats, 4,119 tons lard, 8,352 tons dressed beef, 306 tons flaxseed, 925 tons butter, 1,598 tons hides, 135 tons wool, and 3,490 tons lumber. The three Vanderbilt lines together carried 28 2 per cent. of all the shipments, while the two Pennsylvania lines carried 22.4 per cent.

Coal.

The coal and coke tonnage of the Pennsylvania, originating on lines east of Pittsburgh and Erie, for the week ending Feb. 2, and the year to that date, was as follows:

	Coal.	Coke.	Total.
Total for week ending Feb. 2	203,026	86,703	289,729
Total for year 1889 to date	1,016,266	440,665	1,456,931
Total for year 1888 to date	1,127,276	420,670	1,547,946

The anthracite coal tonnage of the Belvidere division of the United Railroads of New Jersey division for the same periods was as follows:

	1889.	1888.	Dec.
For week ending Feb. 2	23,210	35,935	12,725
For the year 1889 to date	127,017	166,773	39,756

The Cumberland coal trade for the week ending Feb. 9, amounted to 40,152 tons, and for the year to that date 315,771 tons.

Cotton.

The cotton movement for the week ending Feb. 8 is reported as follows, in bales:

Interior markets:	1889.	1888.	Inc. or Dec.		P.c.
Receipts	74,706	42,704	I.	32,002	74.7
Shipments	94,424	53,597	I.	40,827	76.3
Stock	336,521	368,663	D.	32,142	9.5
Seaports:					
Receipts	126,347	99,583	I.	26,764	26.5
Exports	145,070	116,002	I.	29,068	17.5
Stock	909,697	923,683	D.	13,986	10.8

Railroad Earnings.

NORFOLK & WESTERN.

Annual statement of earnings and expenses:

Revenue.

Gross earnings	$4,899,599
Operating expenses and taxes	3,001,927
Proportion of expenses to earnings, 61 per cent.	
Net earnings	$1,897,672
Other income, interest, dividends, etc	147,438
	$2,045,110
Total interest charges	1,296,551
Net income for the year 1888	$748,559
Dividend, 1½ per cent. on preferred shares	330,000
Balance for year	$418,559

Compared with the year 1887 the gross earnings increased $644,805, or 15 per cent.
Oper. expenses and taxes increased 518,147, or 21 "
Net earnings increased 126,658, or 7 "

Comparison of Traffic 1888 *and* 1887. (*Figures for* 1888 *are Approximate.*)

	1888.	1887.	Inc. or Dec.	P.c.
Passengers carried:				
Local passengers	744,269	535,597	I. 208,672	39
Through "	26,979	23,354	I. 3,625	16
Total "	771,248	558,951	I. 212,297	38
Tons of freight carried:				
Local freight	2,354,561	1,829,516	I. 525,045	29
Through "	395,363	379,172	I. 16,191	4
Total "	2,749,924	2,208,688	I. 541,236	25
Passenger earnings	$1,002,551	$812,091	I. $190,460	23
Freight earnings	3,897,048	3,442,703	I. 454,345	13
Total earnings	$4,899,599	$4,254,794	I. $644,805	15
Oper. ex. and taxes	3,001,927	2,483,780	I. 518,147	21
Net earnings	$1,897,672	$1,771,014	I. $126,658	7

	1888.	1887.
Average miles operated	542	527
Earnings per mile	$9,040	$8,074
Net earnings per mile	$3,501	$3,361
Average rate per passenger per mile	2.833	3.041
Average profit per passenger per mile	1.267	1.308
Average rate per ton per mile	0.577	0.635
Average profit per ton per mile	0.215	0.262

CHICAGO, BURLINGTON & QUINCY.

Month of December:	1888.	1887.	Inc. or Dec.	
Gross earnings	$2,167,614	$2,163,328	I.	$4,286
Oper. expenses	1,544,929	1,226,880	I.	318,049
Net earnings	$622,685	$936,448	D.	$313,763
Year to Dec. 31:				
Gross earnings	$23,789,167	$27,576,077	D.	$3,786,910
Oper. expenses	17,804,112	15,212,874	I.	2,591,238
Net earnings	$5,985,055	$12,363,203	D.	$6,378,148

CHICAGO, BURLINGTON & NORTHERN.

December:				
Gross earnings	$183,399	$141,998	I.	$41,401
Oper. expenses	102,257	126,886	D.	24,629
Net earnings	$81,142	$15,112	I.	$66,030
Year to Dec. 31:				
Gross earnings	$2,026,319	$2,276,199	D.	$249,880
Oper. expenses	1,580,359	1,796,232	D.	215,873
Net earnings	$445,960	$479,967	D.	$34,007

Earnings of railroad lines for various periods are reported as follows:

Month of December:	1888.	1887.	Inc. or Dec.	P.c.
Central of Georgia	$750,365	$742,005	I. $8,360	1.1
Net	258,379	282,076	D. 23,697	9.1
East Tenn., Va. & Ga.	479,741	503,288	D. 23,547	4.4
Net	161,630	205,630	D. 44,000	2.7
Knoxville & Ohio	40,599	39,890	I. 709	4.6
Net	15,920	17,291	D. 1,371	9.0
Louis., N. O. & Tex.	316,481	330,385	D. 13,904	4.3
Net	129,244	146,551	D. 17,307	1.3
New Brunswick	65,870	65,570	I. 300	.05
Net	19,617	23,316	D. 3,699	1.8
Northern Central	499,538	490,286	I. 9,252	1.8
Net	289,868	189,811	I. 100,057	50.2
Ohio River	46,356	35,881	I. 10,475	29.9
Net	23,541	16,708	I. 6,833	42.5
Ore. Ry. & Nav. Co.	525,534	539,849	D. 14,315	2.7
Net	108,371	257,802	D. 149,431	54.2
Scioto Valley	54,683	62,901	D. 8,218	14.9
Net	14,278	7,484	I. 6,794	90.7
Southern Pacific Co.:				
Gal., Har. & S. Ant.	344,922	314,878	I. 30,044	9.5
Net	111,091	83,481	I. 27,610	3.33
Louisiana West	83,167	77,846	I. 5,321	6.8
Net	38,222	38,787	D. 565	1.5
Morgan's La. & Tex	581,420	620,732	D. 39,312	6.8
Net	241,703	289,555	D. 47,852	19.8
N. Y. Tex & Mex.	15,839	15,536	I. 303	1.9
Net	501	3,265	D. 2,764	88.0
Tex. & New Or.	126,308	119,126	I. 7,182	5.7
Net	43,378	38,390	I. 4,988	13.0
Tot. Atlan. System.	1,151,656	1,148,119	I. 363,537	32.6
Net	434,859	453,478	D. 18,619	4.2
Union Pacific	2,380,426	2,243,872	I. 136,599	6.9
Net	891,436	764,224	I. 127,212	16.5
Total (gross)	$6,311,149	$6,202,046	I. $109,103	1.5
Total (net)	2,347,143	2,364,371	D. 17,228	.73
Twelve months—Jan. 1 *to Dec.* 31:				
Central of Georgia	$7,344,140	$6,761,746	I. 542,394	8.3
Net	2,521,264	2,399,475	I. 121,389	5.5
East Tenn., Va. & G.	5,615,967	5,329,470	I. 286,490	5.3
Net	1,933,803	1,675,074	I. 258,729	1.6
Knoxville & Ohio	500,286	465,653	I. 34,633	7.3
Net	205,392	165,118	I. 40,274	24.3
Louis., N. O. & Tex.	2,426,317	2,243,213	I. 183,104	8.3
Net	659,114	722,084	D. 62,970	9.5
New Brunswick	869,066	816,445	I. 52,621	6.4
Net				
Northern Central	6,203,390	6,212,926	D. 9,536	1.5
Net	2,109,821	2,073,484	I. 36,337	1.2
Ohio River	473,036	375,217	I. 97,819	25.8
Net	212,541	180,446	I. 32,095	17.7
Ore. Ry. & Nav. Co.	6,379,797	5,376,258	I. 1,003,539	18.6
Net	2,228,444	2,428,553	D. 200,109	8.9
Scioto Valley	665,927	789,125	D. 123,198	18.6
Net	146,804	173,426	D. 26,622	18.1
Southern Pacific Co.:				
Gal., Har. & S. Ant.	3,804,674	3,347,181	I. 457,493	13.5
Net	982,873	682,945	I. 299,928	43.9
Louisiana West	966,494	843,795	I. 122,699	14.5
Net	476,908	414,835	I. 62,073	14.8
Morgan's La. & Tex	5,226,101	4,684,339	I. 541,762	11.5
Net	1,718,678	1,346,279	I. 372,399	27.6
N. Y., Tex. & Mex.	146,527	170,526	D. 33,999	23.1
Net	32,883	22,107	D. 54,990	..
Tex. & N. Orleans	1,438,578	1,276,564	I. 162,014	12.6
Net	424,664	563,353	D. 138,649	32.6
Tot. Atlan. System.	11,582,373	10,313,406	I. 1,268,967	12.3
Net	3,570,242	3,029,522	I. 540,720	17.8
Union Pacific	29,260,824	28,557,766	I. 709,058	21.7
Net	11,326,879	10,941,005	D. 614,126	5.61
Total (gross)	$71,321,123	$56,241,225	I. $15,079,898	26.8
Total (net)	24,914,304	24,788,187	I. 126,117	5.0